



Durham Research Online

Deposited in DRO:

26 June 2008

Version of attached file:

Published Version

Peer-review status of attached file:

Peer-reviewed

Citation for published item:

Rowley-Conwy, P. (2004) 'How the West was lost : a reconsideration of agricultural origins in Britain, Ireland and southern Scandinavia.', *Current anthropology.*, 45 (S4). pp. 83-113.

Further information on publisher's website:

<http://dx.doi.org/10.1086/422083>

Publisher's copyright statement:

Additional information:

Use policy

The full-text may be used and/or reproduced, and given to third parties in any format or medium, without prior permission or charge, for personal research or study, educational, or not-for-profit purposes provided that:

- a full bibliographic reference is made to the original source
- a [link](#) is made to the metadata record in DRO
- the full-text is not changed in any way

The full-text must not be sold in any format or medium without the formal permission of the copyright holders.

Please consult the [full DRO policy](#) for further details.

Durham Research Online

Deposited in DRO:

26 June 2008

Version of attached file:

Published

Peer-review status of attached file:

Peer-reviewed

Citation for published item:

Rowley-Conwy, P. (2004) 'How the West was lost : a reconsideration of agricultural origins in Britain, Ireland and southern Scandinavia.', *Current anthropology.*, 45 (S4), pp. 83-113.

Further information on publisher's website:

<http://dx.doi.org/10.1086/422083>

Publisher's copyright statement:

Use policy

The full-text may be used and/or reproduced, and given to third parties in any format or medium, without prior permission or charge, for personal research or study, educational, or not-for-profit purposes provided that :

- a full bibliographic reference is made to the original source
- a link is made to the metadata record in DRO
- the full-text is not changed in any way

The full-text must not be sold in any format or medium without the formal permission of the copyright holders.

Please consult the full DRO policy for further details.

How the West Was Lost

A Reconsideration of Agricultural Origins in Britain, Ireland, and Southern Scandinavia¹

by Peter Rowley-Conwy

Post-processual views of the transition to agriculture in Northwestern Europe have sought to decouple ideology and subsistence economy as a means of protecting the status of ideology as the sole cause of change. Ideology (as reflected in material culture and monument building) changed abruptly. To achieve the required decoupling, subsistence is therefore portrayed as having changed slowly. This implies three things: (1) Mesolithic foragers were gradually intensifying their subsistence economy. (2) Neolithic people subsisted mainly on *wild* animals and plants and were nomadic. (3) Subsistence change across the ideological transition was slow, continuous, and seamless. Many other scholars, although not post-processualists, have come to accept these three points. But as the post-processual view has become the consensus, the data from Britain, Ireland, and southern Scandinavia have all been leading in the opposite direction: (1) There is no reason to think that Mesolithic foragers were intensifying economically. (2) Neolithic people subsisted mainly on cultivated plants and domestic animals and were fully sedentary. (3) The transition to agriculture was rapid and probably traumatic. The current consensus has yet to incorporate these data into its explanatory framework.

PETER ROWLEY-CONWY is Reader in Environmental Archaeology at the University of Durham (South Rd., Durham DH1 3LE, U.K. [p.a.rowley-conwy@durham.ac.uk]). Born in 1951, he was educated at Cambridge University (B.A., 1973; Ph.D., 1980) and has taught there (1989–90) and at the Memorial University of Newfoundland (1988–89). His research on prehistoric hunter-gatherers and the origins and spread of agriculture has concentrated on Scandinavia and Britain but included Portugal, Italy, Syria, Egypt, and Russia. He is currently studying pig phylogeny, hunting, domestication, and management across the Old World. Among his publications are “Making First Farmers Younger: The West European Evidence” (CURRENT ANTHROPOLOGY 36:346–53), “The Animal Bones from Arene Candide: Final Report,” in *Arene Candide*, edited by R. Maggi (Memorie dell’Istituto Italiano di Paleontologia Umana, n.s., 5), and “Time, Change, and the Archaeology of Hunter-Gatherers: How Original is the ‘Original Affluent Society?’” in *Hunter-Gatherers*, edited by C. Panter-Brick, R. H. Layton, and P. Rowley-Conwy (Cambridge: Cambridge University Press, 2001). The present paper was submitted 31 III 03 and accepted 22 I 04.

1. Earlier versions of this paper have been tested on audiences at universities in Fairbanks, Anchorage, Bergen, Canberra (Australian National University), Copenhagen, Exeter, Lund, Melbourne (La

The appearance of agriculture changed Northwestern Europe forever. In the past 15 years a new interpretation of the transition to agriculture, largely a product of the British post-processual school of archaeology, has been at least partially accepted by many scholars not normally considered post-processualist and, although contested in particular areas, achieved a status close to consensus. In this contribution I will argue that this interpretation is flawed. It arose in opposition to previous interpretations and as a result has taken up a problematic theoretical position. I will argue that the data have unequivocally moved in a different direction and that ignoring or overlooking these data renders the current consensus untenable. Northwestern Europe needs a new understanding of its Neolithic.

“Neolithic” has meant many things. As defined by Lubbock (1865:2–3), it was purely technological, referring to the polishing of stone artifacts. By the twentieth century it had broadened to include sedentary village life, cereal agriculture, stock rearing, and ceramics, all assumed characteristic of immigrant agriculturalists (e.g., Childe 1957). In the late 1960s, reflecting the ecological interests of the “new archaeology,” it narrowed again to refer just to the agricultural mode of subsistence (e.g., Higgs and Jarman 1969).

In the late 1980s, with post-processual archaeology, the meaning shifted again. The Neolithic came to be considered an ideological phenomenon, a new “structure of ideas” (Thomas 1988:65; Tilley 1996:72) or “way of thinking” (Bradley 1998:20; Edmonds 1999:6) manifested as a change in material culture—principally the construction of ritual and funerary monuments from ca. 4000 BC (dates are calibrated). From this perspective, the subsistence economy is no more “fundamental” than other aspects of culture, and therefore ideology cannot be viewed merely as “superstructure” (e.g., Thomas 1991:7–8).

This approach creates an agenda which may be deconstructed as follows: If ideology and subsistence change at the same time, subsistence may still be the fundamental engine driving change. For many scholars the task is therefore to *separate* subsistence from ideological change: if material culture change is *not* synchronized with subsistence change, it must reflect a purely ideological change that outweighs anything economic. Subsistence change is portrayed as slow while change in

Trobre University), Newcastle upon Tyne, Poona (Deccan College), St. Louis (Washington), Sydney, and Uppsala, at Magdalene College (Cambridge), and at the National Museum of Denmark (Roskilde). I am grateful for the feedback these experiences provided. I also thank all those who responded to my requests for literature and information: Niels H. Andersen, Søren H. Andersen, Magnus Andersson, Jan Apel, Geoff Bailey, Göran Burenhult, Gabriel Cooney, Jon Gibson, Gitte Gotfredsen, Fredrik Hallgren, Brian Hayden, Jacqui Huntley, Per Karsten, Bo Knarrström, Lars Larsson, Mats Larsson, Finn Ole Nielsen, Poul Otto Nielsen, Rick Schulting, Becky Scott, Alison Sheridan, Mac Svensson, Peter Woodman, and Marek Zvelebil. Eva Koch and other referees made helpful suggestions. Pam Graves and Tim Murray offered me the benefit of their comments on an earlier draft. None of these should be held responsible for any of the contents.

material culture is abrupt (fig. 1). Subsistence cannot therefore have influenced material culture. This effectively insulates ideology from the taint of economic causation.

Slow subsistence change makes three things axiomatic in the current consensus: (1) Before the ideological change, the Late Mesolithic was intensifying economically towards domestication. (2) After the ideological change, the Neolithic diet still came mainly from nomadic hunting and gathering. (3) Across the ideological change, subsistence change was seamless as local Mesolithic groups gradually adopted agriculture. I will contest all three.

The current consensus is largely British in origin. British scholars from Lubbock (1865) to Whittle (2003) have, however, used evidence from Denmark to support their arguments because the Danish record is better-researched. More recently, Ireland and southern Sweden have also produced impressive archaeological records, and Scandinavian and Irish scholars have of course joined in the debate. This contribution will therefore consider evidence from Ireland, Britain, Denmark, and southern Sweden (fig. 2). All four are partly coastal and acquired agriculture at about the same time, ca. 4000–3900 BC—much later than the interior of temperate Europe at ca. 5500 BC.

An Intensifying Mesolithic?

Axiom 1 requires subsistence intensification in the Late Mesolithic. Despite this, Mesolithic material culture did not change: no monuments were constructed. If Neolithic monuments resulted from ideas not economy, then the absence of Mesolithic monuments must similarly result from an idea—or lack of one.

The argument is developed as follows: Criticism is advanced of suggestions (e.g., those of Case 1969 and Legge 1989) that monument construction required a large agricultural population (see, e.g., Bradley 1993:9; 1998:10; Thomas 1997:60; 1999:8). Other cultural traditions are invoked to demonstrate that hunter-gatherers could build monuments if they chose to; the Poverty Point, Adena, and Hopewell monuments in North America are cited as built mainly by foragers (Bradley 1993:11–13), while even at Cahokia the role of agriculture is minimized (Thomas 1991:19–20; 1999:23). The upshot is the claim that Mesolithic monument construction was not demographically impossible but “literally . . . unthinkable” (Bradley 1998:34).

The North American analogues are dubious. Cahokia was undoubtedly based on intensive maize agriculture (Lopinot 1997). There was significant cultivation of native domesticated plants back to the early first millennium AD at least (Fritz and Smith 1988, Lopinot 1997, Simon 2000). At Poverty Point in the second millennium BC, agriculture played little or no role (Gibson 1998, Ward 1998), but the site lay in an area of tropical lakes, swamps, and watercourses which were hugely productive: its ca. 1,300-km² hinterland contained between 5 and 175 tons of fish per km² (Gibson 2000:166). The waterways were difficult to overexploit because they were restocked annually by the flooding of the Mississippi, and many other species of animals and plants were also available. This environment, aptly described as “cornucopian” (Gibson 2000:164), was unlike any in Mesolithic Europe. Even Danish Late Mesolithic people, settled on a productive coast, probably achieved nothing like the Poverty Point population density, while British and Irish densities were probably even lower. This seriously weakens the argument that because one group of foragers did build Poverty Point, all foragers could have.

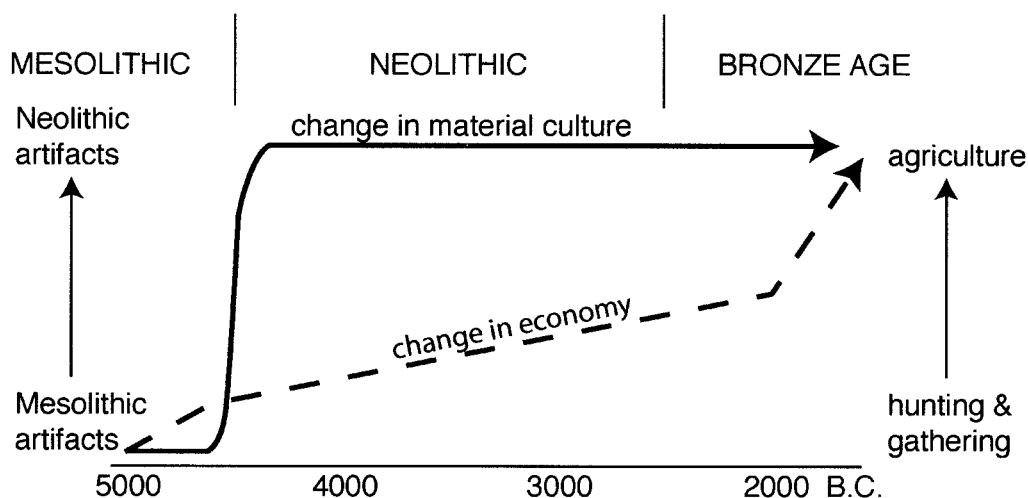


FIG. 1. The current view of change in economy and material culture at the Mesolithic-Neolithic transition in Northwestern Europe (modified from Thomas 1997:fig. 1 and 1999:fig. 2.1). The change in material culture is more usually placed at or just after 4000 B.C.

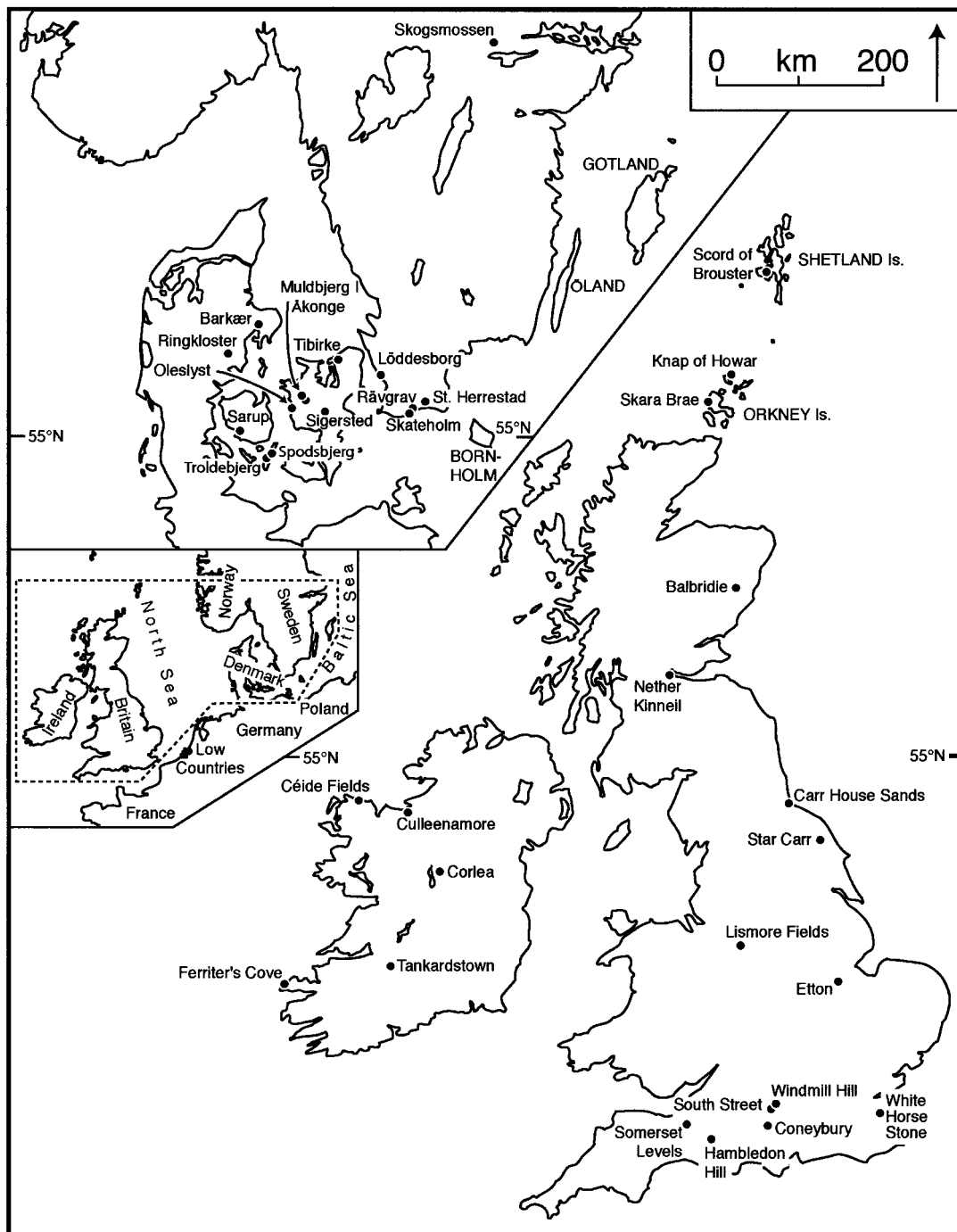


FIG. 2. The Northwest European areas discussed, showing the locations of sites mentioned in the text.

The uniqueness of the Poverty Point environment suggests that in Europe monument construction was indeed impossible without an agricultural population as Case and Legge suggested.

But was the Northwest European Mesolithic intensifying its subsistence economy? If so, population density may have been increasing towards the point where mon-

uments were achievable. Many do favour Late Mesolithic intensification (e.g., Bradley 1998:23; Price 1996: 352; Thomas 1996b:315; 1997:59; and in Scandinavia Blankholm 1996:128–32; Grøn 1997, 1998; Nash 1998: 3–16). Some argue that domestication of indigenous wild animals and plants was occurring (D. L. Clarke 1976; Petersson 1997:184–85; Richmond 1999:7–9; Zvelebil

1994, 1995)² or that wheat was being cultivated on a small scale (Bradley 1993:19; Göransson 1995:62–64; Jennbert 1984; Price 2000:276; Tilley 1996:86).

The idea of Mesolithic intensification is part of a wider debate about hunter-gatherer intensification in general. Some hunter-gatherer variability may have an ecological context. For example, dense coastal populations would exploit local resources more intensively simply because of the larger human population (Rowley-Conwy 2004); this statement is probably uncontroversial. The debate is over whether intensification might occur *without* such an ecological context, for example, in the Late Mesolithic as a trend towards agriculture. This kind of intensification is argued to take place for two reasons: population increase or internal social development.

Population increase for non-ecological reasons relies on early hunter-gatherers' maintaining an artificially low population, increasing only much later—the “slow-track option” (Mulvaney and Kamminga 1999:132–33). Some argue that hunter-gatherers often do this (e.g., Hayden 1972; Lourandos 1997:15–17). However, Boone (2002) shows that contemporary hunter-gatherer fertility rates are similar to those of farmers. Long periods of apparent population stasis in prehistory therefore actually comprise alternating increases and crashes invisible to archaeology. Hunter-gatherer and farmer populations thus have equal capacity to increase; what differentiates farmers is the crash-buffering role of agriculture (Boone 2002). But hunter-gatherers below carrying capacity would be similarly buffered by plentiful resources. They *could* therefore increase their population just as rapidly as farmers—the “fast-track option.” But *would* they? “Cultural controls” might keep population low, but this suggestion treats the group rather than the individual as the unit of selection. Individuals who ignored “cultural controls” would gain a huge evolutionary benefit by filling the underpopulated landscape with their descendants, and hunter-gatherers would probably not be able to police a slow-track demographic policy (Rowley-Conwy 2001:47). Population increase separated from ecological factors is therefore not a likely cause of intensification.

Internal social development is often invoked as the other non-ecological cause of intensification. Hodder advances the *domus* (Latin for “house”) as “a metaphor for the domestication of society” in contrast to the *agrios* (from the Greek for “field”) “which means wild, savage” (1990:41, 86). Before animals and plants could be domesticated, society itself had to become domesticated; “the domus provided a way of thinking about the control of the wild” (p. 39), and “it was through the domus that the origins of agriculture were thought about and conceived” (p. 38). The *domus* is thus a necessary intermediate stage between *agrios*-type hunter-gatherers and

agriculturalists. *Domus* societies are characterized by sedentism, food storage, and hierarchy (Hodder 1990:37), also attributes of Woodburn's (1982) “delayed-return” societies. Hodder treats these societies *diachronically*, *domus*/delayed-return groups developing from *agrios*/immediate-return ones. His formulation can, however, be criticized as progressivist, implying unidirectional global cultural evolution, some societies just being ahead of others. One unavoidable outcome is the implication that contemporary *agrios*-type societies like the San, Hadza, or Aborigines are locked into a pre-*domus* state of irredeemable and archetypal “wildness,” a suggestion with which many contemporary anthropologists might disagree. The archaeological and anthropological hunter-gatherer records in fact reveal flexibility rather than progress: societies may change rapidly towards either *domus* or *agrios* strategies, depending on local circumstances. It is therefore more useful to consider these strategies *synchronously*, emphasizing variability rather than directional change (Keeley 1988, Rowley-Conwy 2001). Social flexibility and rapid non-directional change make up a preferable non-progressivist alternative.

There are therefore theoretical problems with both population increase and internal social development as causes of intensification in the European Late Mesolithic, and certainly such intensification cannot be assumed. If it is to be accepted, it must be on the basis of the archaeological evidence. The British Late Mesolithic has actually provided very little relevant evidence of any kind; this is one of those cases mentioned above in which Northwestern Europe as a whole relies heavily on the evidence from Denmark and southern Sweden.

Intensification of the collection of wild plants has been suggested (D. L. Clarke 1976, Zvelebil 1994), but it is unlikely that any kind of indigenous agriculture was emerging as a result. Many of the plants discussed by Clarke are unsuitable for such treatment (Rowley-Conwy 1986:27–28). Acorns and hazelnuts occur on Mesolithic sites, but there is no evidence that their collection increased through time; they are not annual plants and are unlikely to form the basis for a quasi-agricultural system. There is very little evidence for the collection of appropriate small-seeded annuals and none for their cultivation (Rowley-Conwy 2004).³

Intensified exploitation and perhaps local domestication of animals is sometimes suggested, for example, for red deer (Jarman 1972). Cervids, however, are territorial during the mating season and do not form fixed-membership herds, which makes them behaviourally unsuitable for domestication (Rowley-Conwy 1986:26). Jarman's suggestion was based on sex ratios obtained from antlers at Star Carr, which indicated a cull heavily biased towards males. The antlers were, however, collected for working and did not reflect the actual sex ratio of the

2. I have been surprised to see myself quoted by Richmond (1995:5), Thomas (1996b:314; 1998:47), and Zvelebil (1995:86; 1996:334), as claiming domestic cattle and/or pigs in the Danish Late Mesolithic. This appears to result from insufficiently close reading; I take this opportunity to stress that I have never made such claims and have indeed always argued against them (Rowley-Conwy 1995, 2003a).

3. A few grass species native to Europe, for example, *Elymus arenaria*, have pollen grains as large as those of cultivated cereals. This is, however, an intrinsic characteristic of these grasses and has nothing whatever to do with their being cultivated in the Mesolithic; cultivation would not have altered pollen size (contra Zvelebil 1994:50).

red-deer cull at Star Carr; males and females were killed in about equal numbers (Legge and Rowley-Conwy 1988: 48–58).

Cattle lived wild in Europe, but the domestic forms were probably imported rather than indigenously domesticated. Two significant sites have a few domestic cattle bones in a largely wild fauna: Ferriter's Cove in Ireland is Late Mesolithic (Woodman, Anderson, and Finlay 1999:90), while Åkonge on the Danish island of Zealand is transitional to the Early Neolithic (Gotfredsen 1998:96–97). These are significant because *wild cattle were present on neither island*; these specimens were definitely imported. In both cases the individuals were identified as small domestic rather than large wild animals. This pattern recurs in areas where wild cattle *were* present; the substantial size difference between wild and domestic argues against local domestication because there are no transitional ones (Rowley-Conwy 1995, 2003a). Initial results from ancient DNA support the import hypothesis: there is a considerable genetic difference between prehistoric British aurochs and modern domestic cattle (Troy et al. 2001).

Mesolithic control of wild boar has been suggested because “a tame pig or two would act as an efficient converter of surplus food” (Zvelebil 1995:86). However, wild pigs function in exactly the same way, with the added advantage that people do not have to feed them through times when no surplus food is available. It is rather difficult to see what niche a tame boar would have occupied in a Mesolithic society without agricultural plant waste or stubble fields. Zvelebil states that pig bone frequencies on Mesolithic sites increase through time, but no such trend is visible in his figure 8. He further suggests (p. 96) that winter killing and healed shot wounds indicate “close contact” between pigs and humans. The clearest Mesolithic winter site is Ringkloster in Denmark, which is a hunting camp from which joints of pork were exported—a classic logistic hunting strategy which has nothing to do with controlling the animals (Rowley-Conwy 1998a, Rowley-Conwy, Halstead, and Collins 2002). The healed shot wounds testify to close contact with arrows rather than with swineherds. Finally, Zvelebil (pp. 94, 95) states that there was selection for more juvenile pigs in the Late Mesolithic. Age data from numerous Mesolithic sites in Denmark and southern Sweden (fig. 3) show variability but no time trend; some of the highest proportions of juveniles occur in the Early Mesolithic, probably because the sites were occupied in summer when juveniles are particularly numerous (Rowley-Conwy 1993). Pigs were transported to Ireland in the Mesolithic, but this does not mean that they were domestic. The planting of wild animal populations on islands for hunting purposes is widely attested; in Neolithic Europe, red deer were taken to Corsica and Sardinia, fallow deer to Cyprus, and marsupials to New Britain as early as 19,000 years ago (Vigne 1988, Davis 1984, Flannery and White 1991). Metrical evidence suggests that domestic pigs were actually introduced at the start of the Neolithic (Rowley-Conwy 1995, 2003a).

There is, then, no good evidence for the intensified use

of native plant or animal species. What of the claims for Late Mesolithic wheat cultivation? This non-native cereal would have to have been obtained from Neolithic farmers to the south. Grains of pre-Neolithic cereal pollen are occasionally found, but their identity and status must be treated cautiously (Innes, Blackford, and Rowley-Conwy 2003). Actual cereal grains have not been proven in Mesolithic contexts. Three grain impressions in “Mesolithic” pottery from Lödösborg in southern Sweden are often said to demonstrate Mesolithic cultivation (Price 2000:276; Tilley 1996:86; Zvelebil 1996:fig. 18.6), but the sherds all postdate a radiocarbon determination falling at the very end of the Mesolithic (Jennbert 1984:62–63). The Mesolithic and Neolithic potsherds were intermingled throughout the sequence and very hard to separate typologically (p. 49), while at other sites Neolithic pottery is always found stratified *above* Mesolithic pottery. Scandinavian scholars universally mistrust Lödösborg, considering it a deeply disturbed site (M. Andersson 2003:74; Kristiansen 1993:248; M. Larsson 1984:169; Malmer 2002:16; Madsen 1986:235; P. O. Nielsen 1985:121 n. 31; Persson 1999:45–46), something also suggested by the Iron Age C¹⁴ dates it has yielded (Jennbert 1984:62–63).

In summary, the Late Mesolithic was *not* progressing towards agriculture. There are no theoretical grounds for intensification without an ecological context, and there is no archaeological evidence that intensification was taking place. Large permanent settlements actually appear in southern Scandinavia in the *Middle* Mesolithic, for ecological reasons: sea-level rise brought productive environments to the region (Rowley-Conwy 1999:137–40; 2001: 54–56). Therefore axiom 1 of the current consensus is not supported.

A Foraging Neolithic?

Axiom 2 requires Neolithic subsistence to have been based mainly on wild resources. According to Thomas (1993:388), for example,

Domestic resources, both animal and plant, had an importance in Neolithic Britain which was primarily symbolic. They were deployed in ritual, exchange and feasting Neither played a major part in feeding people from day to day, and these people were, from an economic point of view, still formally Mesolithic.

Domestic plants and animals are here portrayed as part of the Neolithic “idea” rather than of the Neolithic economy. The current consensus plays down the economic importance of cultivated plants and domestic animals. It also stresses settlement mobility and the absence of permanent domestic buildings.

CEREAL AGRICULTURE

The limited importance of cereal agriculture in the British Neolithic is generally accepted (e.g., Bradley 1993:

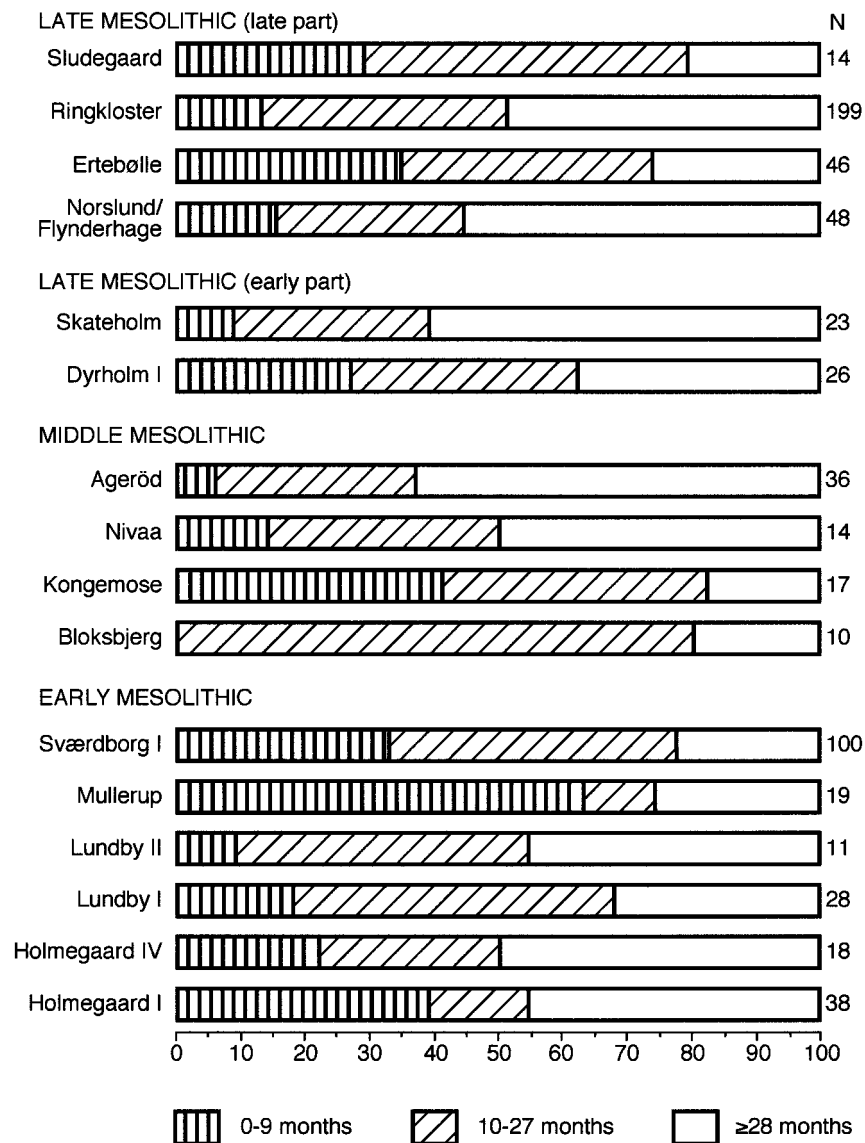


FIG. 3. Age at death of Mesolithic pigs in Denmark and southern Sweden (see Rowley-Conwy 1993 for the method of ageing). Sludegaard, Nivaa, Kongemose, and Bloksbjerg data from Dobney et al. (in preparation), the rest from Rowley-Conwy (unpublished records).

16; 1998:52; Edmonds 1997:103; 1999:16; Fairbairn 1999, 2000; King 2001:324; Pollard and Reynolds 2002:42; Richmond 1999:3-4, 32-34; Robinson 2000:89; Thomas 1991:20-25; 1993; 1996a:4; 1996b:318-9; 1997:59-60; 1999:29; 2003:71; Waddington 2000:41; Whittle 1999:59; 2003:40, 157; Whittle, Pollard, and Grigson 1999:348). Some Scandinavian scholars have agreed (e.g., Kaelas 1991:94-95; Petersson 1997:183-84), but most such arguments concerning Scandinavia have come from Anglo-Americans; for example, Price (1996:357) states that in southern Scandinavia "agriculture only became the primary subsistence regime" around 2300 BC, some 1,600 years after the start of the Neolithic (see also, e.g., Thorpe 1996:134; Tilley 1996:94-96; Whittle 1996:229).

Flotation for plant remains is more common in Britain than in the other regions considered here, so the arguments are based mostly on British material. Samples are often small and diverse, usually containing a minority of cereal grains; hazelnut shell is often more frequent, and wild apple/pear and weed seeds are also common (fig. 4, A). If these samples are interpreted at face value, cereal cultivation was indeed a minor aspect of British Neolithic diets. The situation is not so straightforward, however. Macrobotanical items go through a variety of pathways to reach the archaeological record, and consideration of this is essential before samples can be interpreted. Interpreting the activities that produced the archaeology is, however, an exercise in middle-range the-

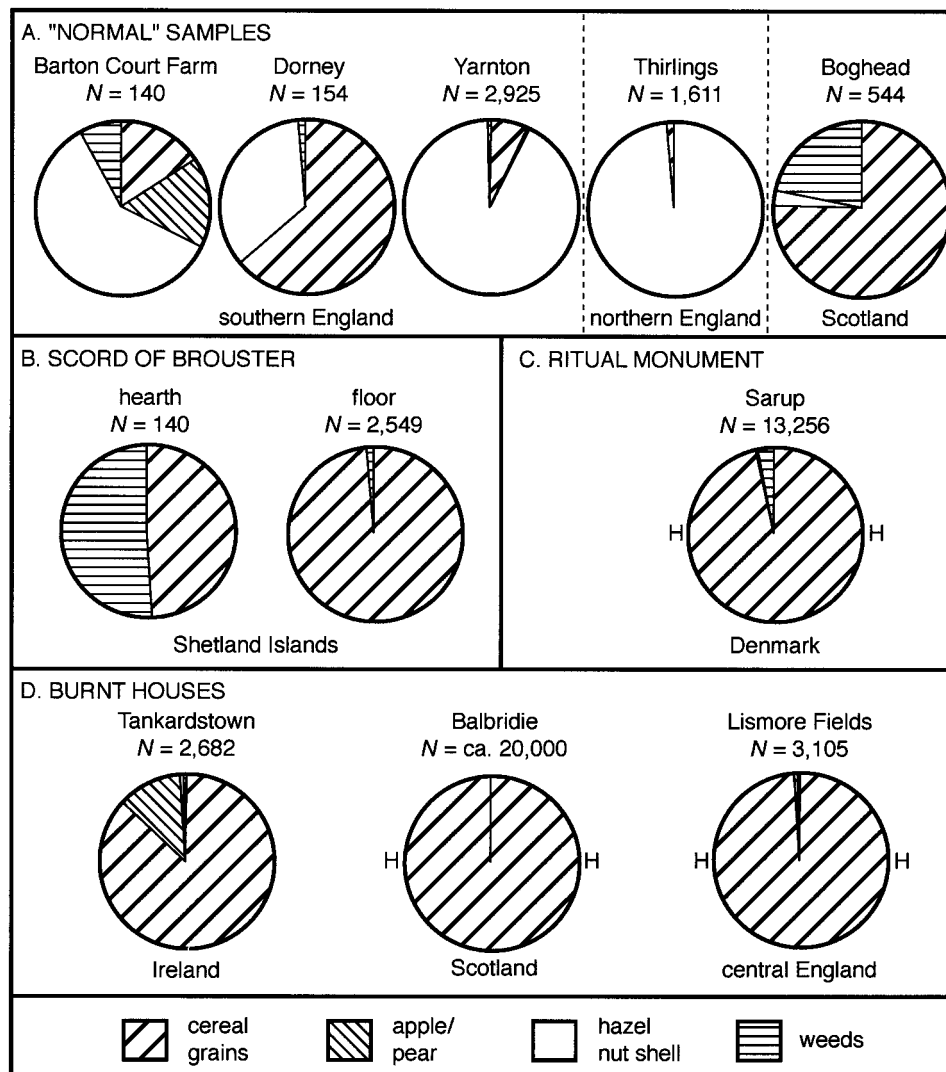


FIG. 4. Proportions of cereal grains, apple/pear fragments, hazelnut shell fragments, and weed seeds in some Neolithic assemblages. N, number of items counted; H, hazelnut shell present but not quantified (does not approach cereal frequency). Barton Court Farm and Thirlings from Moffett, Robinson, and Straker (1989), Dorney and Yarnton from Robinson (2000), Boghead from Maclean and Rowley-Conwy (1984), Scord of Brouster from Milles (1986) ("floor" is sum of samples 79 and 82, "hearth" of samples 56–58), Sarup from Rowley-Conwy and others in N. H. Andersen (1999), Tankardstown from Monk (1988), Balbridie from Fairweather and Ralston (1993), Lismore Fields from Jones (n.d.).

ory, and this makes it controversial. Middle-range theory is closely linked to the "new archaeology" and has been written off by post-processual archaeology because it ignores the uniqueness of each cultural context. "There can be no universal cultural relationship between statics [the archaeological record] and dynamics [the activities that created the record]" (Hodder 1986:116).

It is one thing to criticize the theoretical underpinnings of middle-range theory. It is quite another to assume that the problems middle-range theory sought to address have therefore gone away. Yet this is the current British consensus position: denying itself a methodology

for interpreting macrobotanical samples, it has no alternative but to "let the data speak for themselves." The inevitable outcome is the conclusion that hazelnuts were more important than cereals in the Neolithic diet. Others nevertheless do consider the complexities of the samples. Hazelnut shell is robust and survives charring well. It occurs in quite large fragments that are visible during excavation, which is rarely the case for cereal grains. The visible presence of nut shell is sometimes the reason a botanical sample is collected in the first place. For this reason alone, hazel is likely to be over-represented, but there are others. Cereal grains were usu-

ally intended for consumption, so their preservation by charring happened only by mistake. Hazelnut shell fragments, however, had no further uses and could be disposed of—or may actually have been used as kindling. Hazel is thus much more likely to be preserved and recovered and hence to be overrepresented in the archaeological record (Jones 2000, Legge 1989, Monk 2000).

Wild apple and/or pear may be relatively common for a specific reason: the establishment of a forest clearing would in due course have created a “mantle vegetation” around its edges, a semi-natural hedge separating the clearing from the forest. Such a mantle would for ecological reasons have contained many fruit-bearing species such as apple and pear—and also hazel (Groenman-van Waateringe 1983, Monk 2000). These fruits may therefore be a by-product of agricultural settlement. (This of course assumes that the clearing was fairly long-lasting; this will be discussed below.)

Weed seeds may not have been collected for food but probably do result from the processing of crops for human consumption. Ethnographic studies of wheat and barley processing have revealed a multistage process. Each cultural context may be unique, but there is really only one way these crops can be cleaned. The process involves threshing, then winnowing to remove lightweight waste, coarse sieving to remove contaminants larger than cereal grains, fine sieving to remove smaller contaminants, and hand cleaning to remove contaminants of the same size. The crop is usually threshed, winnowed, and coarse-sieved before being stored; fine sieving and hand cleaning are often done on a daily basis, prior to grinding (Hillman 1981, Jones 1984). Fine sieving generates a waste product made up of small weed seeds and chaff fragments that in recent times formed ideal hen food—but there were no chickens in Neolithic Europe. There was no obvious use for this waste product, which would often have been thrown on the fire, where it was charred and preserved. Hearths are commonly sampled for macrobotanical remains, so it is not surprising that such waste products are common. Well-sampled sites may produce both waste products (burnt deliberately) and cleaned grain (burnt by accident), as at Scord of Brouster (Milles 1986) (fig. 4, B). (This site is in the Shetland Islands, too far north for hazel or apple/pear.)

Taphonomic considerations thus suggest that hazel, apple/pear, and weeds may all be overrepresented compared with cereals. The observed pattern is in fact consistent with a cereal-based economy represented largely by its inedible waste products, supplemented by wild fruits and nuts. This would be a legitimate conclusion regarding the samples in figure 4, A, even in the absence of major cereal finds. Major cereal finds have, however, turned up. Some of these are from ritual monuments, for example, Hambledon Hill in Britain (Legge 1989) and Sarup in Denmark (N. H. Andersen 1999; fig. 4, C). These indicate the symbolic use of cereals proposed by Thomas and therefore *might* not mirror the domestic economy. One other category is, however, very important: cereal finds from burnt buildings. Three are currently known

(fig. 4, D). They probably represent material in store when the building was burnt, because the roof space of such structures would have formed an ideal storage environment (Rowley-Conwy 2000).

The current consensus does not, however, reflect the evidence of these important samples. Some have sought to separate this evidence from the domestic sphere and locate it entirely in the area of ritual. Thomas (1999:25) argues that the structures “represent specialised storage, consumption or redistributive locations for a very special kind of food, rather than simply farmsteads” (see also 2003:71). Richmond (1999) seeks to exclude cereals from domestic contexts entirely: pollen sites suggestive of cultivation are “special areas within the social and economic framework of crop utilisation”; the burnt structures indicate “food storage rather than occupation”; cooking evidence “comes from sites which were not used for occupation”; and ceramics with cereal impressions may have been “imported, indicating that the grain imprints are foreign to the sites” (pp. 32, 12, 33). Richmond’s conclusion is that “the available data indicate cultigen presence, but not necessarily actual cultivation. Upon the majority of sites where crops have been suggested there is little or no proof of agriculture” (p. 33). The conclusion derives mainly from the a priori assumption that Neolithic diets were based mainly on wild foods and that agricultural products belong in the ritual sphere. Cultivation, storage, and cooking are, however, classic domestic activities, and the evidence is best interpreted as such. Domestic activities may be ritualized, but cereals are equally nutritious whether or not their consumption has ritual overtones. Ritual is best re-embedded in the cultural totality, not used as a denial of domesticity.

The argument for mostly wild foods is a particularly English one. Few Scandinavians have joined in the discussion (perhaps because plant remains receive less emphasis in Denmark and Sweden). Objections have been voiced in the Celtic regions, both Scotland (Barclay 1997: 141–44) and Ireland (Cooney 1997:27; 2000:40–41), and among archaeobotanists, both dismissable as peripheral. But the archaeobotanical evidence is persuasive, and the Irish and Scottish cereal stores (Tankardstown and Balbridie respectively) date from the beginning of the Neolithic, suggesting a major role of cultivation from the start of the period. The English evidence is similar: the Lismore Fields cereal store is likewise *Early* Neolithic. Cereal cultivation was probably predominant everywhere in Northwestern Europe from very early in the Neolithic.

DOMESTIC ANIMALS

The current consensus also plays down the role of domestic livestock. It is certainly true that major faunal samples are rare for the first few centuries of the Neolithic. Large samples dating from around 3300 BC come from Windmill Hill in Britain (Grigson 1965) and Troldebjerg in Denmark (Higham 1967). Both are dominated by domestic animals, but both are ritual monuments.

The earliest major faunal sample from a settlement is from Rävgrav in Sweden, also dating to ca. 3300 BC. Of the large mammals, 97% are domestic and only 3% wild (Jonsson, cited in L. Larsson 1992). Samples from earlier centuries are smaller; in Denmark, however, they suggest a predominance of domesticates from the start of the Neolithic (Aaris-Sørensen 1988; Koch 1998:243–51). Only at Muldbjerg I is there a predominance of wild fauna, but this site was on a floating peat island in a lake and was probably an outlying hunting camp (Noe-Nygaard 1995:67–69). The situation is similar in Britain: with one exception, none of the Neolithic samples plotted by Thomas (1991:fig. 2.4) has over 15% wild animals. The exception is a single Early Neolithic pit from Coneybury containing the remains of some ten domestic cattle, seven roe deer, two red deer, and two pigs. The sample accumulated rapidly and may represent a single butchery episode (Maltby 1990), and when meat weights are calculated the two deer species provide only 20% (Rowley-Conwy 2003b). This is the nearest to a deer-dominated Neolithic fauna that Britain can provide.

Domestic animals were probably predominant from very early on; as with cereal agriculture, there is no sign of a lengthy transitional period. Small-scale but intensive cattle management has long been argued by Legge (1981), who uses the animals' age and sex parameters to argue for dairy production in Britain and for meat production in Denmark. Dairying in Early Neolithic Britain has recently been supported by the demonstration that some ceramics contained dairy products (Copley et al. 2003). Manure may also have been important as a fertilizer. A cow produces between 9 and 14.5 tons of manure per year (McConnell 1897:116–17), and Neolithic cultivators would surely have recognized its efficacy.

STABLE ISOTOPES IN HUMAN BONE

Stable isotope analysis is an increasingly useful way of examining prehistoric diets independently of the animal bone and plant evidence. Stable carbon ($\delta^{13}\text{C}$) in bone varies with the ratio of marine to terrestrial foods consumed (C_4 plants are similar to marine foods in this respect, but there were none in Neolithic Europe). Early work undertaken in Denmark (Tauber 1981, 1982) showed a remarkably rapid shift from mainly marine foods in the Late Mesolithic to mainly terrestrial foods in the Early Neolithic, suggesting a rapid shift to an agricultural diet. This rapid shift conflicts strongly with the slow subsistence change currently envisioned, and therefore doubts have been raised about the technique (Whittle 1996:229). A potential source of error is that most of Tauber's Mesolithic individuals were coastal while his Neolithic ones came from the interior, with the result that the shift could be geographical rather than chronological (Bailey and Milner 2003). Several recent studies have addressed this problem by sampling coastal Neolithic individuals, and they uniformly show that even in coastal regions people ate a mainly terrestrial diet from early in the Neolithic. This is true for the coasts of southern Wales (Schulting and Richards 2002a),

western Scotland (Schulting and Richards 2002b), Ireland (Woodman n.d.), eastern Denmark (Richards and Koch 2001), and western Sweden (Sjögren 2003). The complex history of the Baltic Sea makes determinations in this area more problematic, but there is a clear shift towards a terrestrial diet in southern Sweden and Öland (Lidén 1995) and on Gotland (Lindqvist and Possnert 1997).

Thomas (2003) seeks to cast the dietary change in Britain as part of the Neolithic cultural package by arguing for a "cultural prohibition on marine foods . . . or taboo" (p. 70). This goes beyond what the isotopic evidence can show, however: *predominance* of marine or terrestrial foods can be demonstrated, but total dietary *exclusion* of either cannot. Conventional archaeology reveals that marine foods certainly were exploited in the Neolithic. In the Orkneys, marine molluscs and offshore fish were exploited at Knap of Howar (Evans and Vaughan 1983, Wheeler 1983) and Skara Brae (D. V. Clarke 1976). Farther south in Scotland there are large Neolithic shell middens at Nether Kinneil and elsewhere (Sloane 1986), as there are at Culleenamore in Ireland (Österholm and Österholm 1984). Ireland has other evidence for Neolithic marine exploitation (Woodman n.d.), and in Denmark there are both large marine fish traps like that at Oleslyst (Pedersen 1997) and settlements with fish bones (Enghoff 1991). These are all far from southern England, but they are the regions from which the isotope data come. The case for a total taboo in Britain is therefore not strong; a predominantly terrestrial diet is as much as we can currently demonstrate.

It has been postulated that the Neolithic terrestrial foods might have been wild rather than domestic (Tilley 1996:96; Thomas 2003:69), but this is very unlikely: the interior supported relatively few Late Mesolithic hunter-gatherers and would not have been able to sustain the much larger Neolithic population without a predominantly agricultural economy. The isotope evidence thus supports the argument that there was a rapid transition to agriculture at the start of the Neolithic.

SETTLEMENT PATTERNS

Most Late Mesolithic coastlines round Britain and Ireland are now underwater, so a comparison between Late Mesolithic and Early Neolithic settlement patterns cannot be effectively undertaken. In most of Denmark and southern Sweden, however, coastal areas are now above water, and settlement patterns across the transition can be examined. Throughout this area, settlement pattern shows an abrupt shift to the interior at the start of the Neolithic. In southern Sweden, "the settlement pattern was radically altered, and the emphasis shifted from the coast to the inland areas" (M. Larsson 1986:244); the pointed butted axe, characteristic of the earliest Neolithic, has a markedly inland distribution (M. Andersson 2003:fig. 10). Major settlement shifts also occur in Denmark (P. O. Nielsen 1985:115) and on the Baltic islands of Bornholm (F. O. Nielsen 1997) and Gotland (Österholm 1989). The shift is rapid, and the earliest Neolithic phase is not in any sense transitional; earliest Neolithic

find spots are generally less numerous than those of later periods, but their distribution is the same. This agrees with the isotope evidence and suggests that the transition to an agricultural economy was rapid.

FIELD SYSTEMS AND WATER CONTROL

Field systems and water control are clear signs of commitment to agriculture. Richmond (1999:33) states that there is “an almost total absence of field system or water control evidence” in the British Neolithic. Early field systems are, however, unlikely to survive, because later cultivation will usually erase the earlier traces. One Neolithic field system does, however, survive—a 2.5-ha arrangement in association with the settlement at Scord of Brouster, well-sampled for its botanical remains (Whittle et al. 1986). This site is not exactly in the breadbasket of Britain, so other areas may be expected to have had larger systems which have not survived.

One much larger system is known, the Céide (formerly Behy-Glenulra) field system in western Ireland. This system comprises co-axial stone walls covering in excess of 12 km² and has survived because blanket peat grew over it, protecting it from later depredations. The larger fields were probably for livestock, although smaller enclosures could have been for arable and contained settlements (Caulfield 1983). If such a huge system was Neolithic, it would demonstrate the importance of agriculture and threaten the current consensus. There has therefore been a tendency to suggest that the Céide fields are poorly dated (Thomas 1996a:4), belonging to the end of the Neolithic (Richmond 1999:33). There has never been any good reason to suggest this. The earliest publication quotes a C¹⁴ determination older than ca. 3000 BC (Caulfield 1978). More recently a series of dates has shown that the peat had already covered the fields by ca. 3100 BC (Caulfield, O'Donnell, and Mitchell 1998). How much earlier than this the fields were originally constructed is unknown, but they certainly date from early in the Neolithic. Cooney (1997:28) mentions several other Irish cases that may be similar. Field systems are likely to have been widespread across the better agricultural areas of Britain and southern Scandinavia as well, but they have not survived the subsequent millennia of tillage.

Water control systems are not known in Britain or Ireland. Spodsbjerg in Denmark, however, has a Neolithic dam some 12 m in length surviving to a height of 60 cm. It consists of four parallel log walls held between retaining posts; its construction is dated by dendrochronology to just after 3000 BC. It was next to a large settlement and created a substantial pool probably for watering cattle (Sørensen and Bech 1998).

ARD FURROWS

Ard furrows have been found on the original land surface below burial monuments. The earliest British find comes from beneath the South Street long barrow, dated to ca. 3500 BC (Evans, cited in Ashbee, Smith, and Evans 1979).

Many cases are known from Denmark; Thrane (1989:fig. 4) plots 12 (and one more in Sweden) from the period 3200–3500 BC. Earthen long barrows are older than this, but ard furrows have not been found beneath them (Thrane 1989), a conclusion which still holds good today (P. O. Nielsen, personal communication). Ard furrows under burial mounds could have been part of funerary ritual (Rowley-Conwy 1987); if so, the ard *might* have been present earlier but not used in such rituals, but at the moment an Early Neolithic pre-ard phase a few centuries long is plausible. It has been suggested that such ard furrows played a purely ritual role and need not indicate cultivation (Thomas 1999:24). This, however, removes them from the broader Neolithic context: whatever the status of the furrows beneath the mounds, they reveal that the ard was present, and it is inconceivable that it was used *only* for funerary rituals. The ard testifies to a considerable commitment to agriculture. Oxen must be fed and trained over a long period, a substantial investment. Use of the ard indicates that fields of some size were being cultivated, which in turn suggests substantial arable production.

NOMADIC SETTLEMENT

Part of the argument for a mainly foraging Neolithic is that settlement was nomadic not sedentary. Whittle (1997:22) argues for a nomadic settlement pattern until the Middle Bronze Age (see also, e.g., Bradley 1998:53; Edmonds 1999:17–19; King 2001:327–30; Pollard 1999; Pollard and Reynolds 2002:31; Richmond 1999:10–15; Thomas 1991:14–19; 1999:29; Whittle 2003:40–43). Once again, fewer Scandinavians have concurred, and the arguments for Neolithic nomadism there have come mostly from outside (Hodder 1990:184; Price 1996:349; Whittle 1996:229; 1997:22), although shifting cultivation has been suggested by Scandinavian scholars.

In Mesolithic studies, settlement seasonality has been a major topic. Mesolithic analyses involve detailed consideration of as many types of organic evidence as possible. Northwest European examples include Mount Sandal in Ireland (Woodman 1985:156–68), Star Carr in Britain (Legge and Rowley-Conwy 1988, Mellars 1998), Ringkloster in Denmark (Rowley-Conwy 1998a), and Skateholm in Sweden (Rowley-Conwy 1998b). Such analyses have not been undertaken for the Neolithic, partly because suitable samples are scarce. As a result, the Neolithic discussion is based on less satisfactory arguments. Three aspects will be considered here: shifting cultivation, houses and settlement, and coppicing.

Shifting cultivation is commonly suggested for both Britain (e.g., Whittle 1999:64) and southern Scandinavia (e.g., Jensen 2001:258). The suggestion is based on the agricultural typology of Boserup (1965), which assumes that the earliest agriculture will be a “long-fallow” type with forest clearance and burning, one or two years’ cultivation, and then some decades of forest regeneration; intensification involves progressively shortening the fallow and increasing labour input (e.g., by ploughing, manuring). Ard furrows imply longer-lived fields, but, as

mentioned above, evidence for the ard does not go back to the earliest Neolithic. It is sometimes assumed that shifting cultivation is the only alternative to permanent ard-based agriculture (Barrett 1994:143). However, permanent and intensively managed fixed plots can be cultivated with hoe and digging stick (Barclay 1997:142; Jones 2000:83), and such agriculture has recently been demonstrated for the Early Neolithic of central Europe by a close consideration of the associated weed floras (Bogaard 2002a).

In Britain, shifting cultivation is proposed without the citation of much evidence in support as an incidental aspect of the nomadic subsistence system based on wild species. In Denmark the suggestion is based on the detailed pollen analyses of S. T. Andersen (1992, 1993), which reveal that the soil forming Neolithic burial mounds contains burnt tree pollen and unburnt cereal, grass, and herb pollen, argued to indicate burning followed by cultivation. However, any stratigraphic contexts in the old soils were lost when they were heaped up to form the mounds, and therefore the sequence of activities that gave rise to the pollen is not clear. There is no indication that the clearances were cultivated only for a year or two or that there were repeated clearances in the same area as would be the case for shifting cultivation. The main problem facing shifting cultivators in Northwestern Europe would have been the seasonal distribution of rainfall, which makes it very difficult to burn felled forest at any time except midsummer—but cereals would have been planted in either spring or autumn, and burning at these times of year is rarely possible (Rowley-Conwy 2003b). It is much more likely that Neolithic cultivation was in fixed plots worked with digging sticks.

Houses and settlement are a vexed problem. Many settlements consist of just scatters of pits. In Britain pits have been adopted as evidence for nomadism (e.g., Edmonds 1999:18; Richmond 1999:11), but the information return from a pit is limited—in Denmark, excavators of similar pit scatters have no problem in regarding them as sedentary fully agricultural sites, as at Sigersted (P. O. Nielsen 1985). Houses are almost universally said to be rare. “It appears that across a large area of northwest Europe . . . timber houses represented only a minor (if recurring) element of neolithic culture” (Thomas 1996a: 6; see also Whittle 1996:233–34). This argument appeared first in Denmark (Eriksen and Madsen 1984). Bradley (1998:3–9) discusses the Danish Early Neolithic site of Barkær, which produced two structures each 90 m long. Originally interpreted as longhouses (Glob 1949), they were later shown to be earthen long barrows (Madsen 1979). Bradley treats this reinterpretation of Barkær as the symbolic starting point for his discussion of a monument-rich but largely house-free Northwest European Neolithic. For Britain, Thomas (1999:18) mentions “the absence of substantial domestic architecture . . . until well into the Bronze Age” (also 1991:8–9; 1996a); Pollard and Reynolds (2002:31) describe Neolithic structures as “light, impermanent affairs” (also, e.g., Bradley 1993:8; 1998:3–9; Evans, Pollard, and Knight

1999; King 2001:324; Pollard 1999; Richmond 1999: 10–15; Whittle 1999:63).

The current consensus has dealt with the few houses it does recognize in the same way as with other conflicting evidence by writing them out of the domestic context. We have seen that burnt cereal stores like Balbridie are argued not to have been permanently occupied. Others are similarly dealt with for even more tenuous reasons. For example, Richmond (1999:13) doubts the domestic nature of Lismore Fields because next to the structures are two lines of posts with no obvious function; Thomas questions one house because it has too few stone tools (1996a:7), another because it has too many (pp. 9–10). The plain fact is, however, that Neolithic houses in Northwestern Europe are neither flimsy nor rare. Recent excavations have revealed a very large number of structures; reviews may be found in Artursson et al. (2003) for Sweden, Darvill (1997) for Britain, Grogan (2002) for Ireland, and P. O. Nielsen (1997) for Denmark, and even these do not list them all. Many houses have received only preliminary publications, while others are discussed in reports with limited circulation.

My own list of houses (fig. 5, A) is based on the following three criteria: (1) They must be *Early* Neolithic; in Denmark and Sweden this includes structures dated to the Early/Middle Neolithic boundary and earlier but not definite Middle Neolithic ones even if firmly dated to phase Ia or ones with vaguer dates such as “Early or Middle Neolithic.” This effectively means that the houses probably date to ca. 3300 BC or earlier, and this cut-off point is used for Britain and Ireland as well. (2) They must have reasonably clear plans, so that at least one dimension can be estimated; uninterpretable posthole scatters are excluded. (3) Minimum size must be 5 m. The list has no fewer than 175 houses (Rowley-Conwy 2003b:table 1); Ireland has 44, Britain 31, Denmark 48, and southern Sweden 52. If the entire Neolithic had been included, it would have contained several hundred more. They range in size from the 5-m threshold up to 20 m or more in length. Barkær makes a symbolic reappearance not because of the two long barrows but because the post holes of the underlying settlement represent at least two substantial houses (Liversage 1992:pl. 4).

Northwest European archaeology has a history of failing to find houses in a certain period, assuming nomadism, and then finding numerous houses after all. For example, the first Bronze Age settlement in Denmark was recognized in 1909, but no house was discerned. For half a century Danish Bronze Age people were assumed to have been tent-dwelling pastoral nomads; the first longhouse was recognized in 1957 (Thrane 1985), and hundreds are now known. When the dates of publication of the Early Neolithic houses are plotted, it is clear that the same thing is currently happening for this period (fig. 5, B). After decades of nervousness and uncertainty, excavators have become confident in their recognition of these houses.

There are other factors too. Fowler (1981) suggested that many Neolithic landscapes might lie buried beneath erosion deposits caused by later agriculture. Thomas

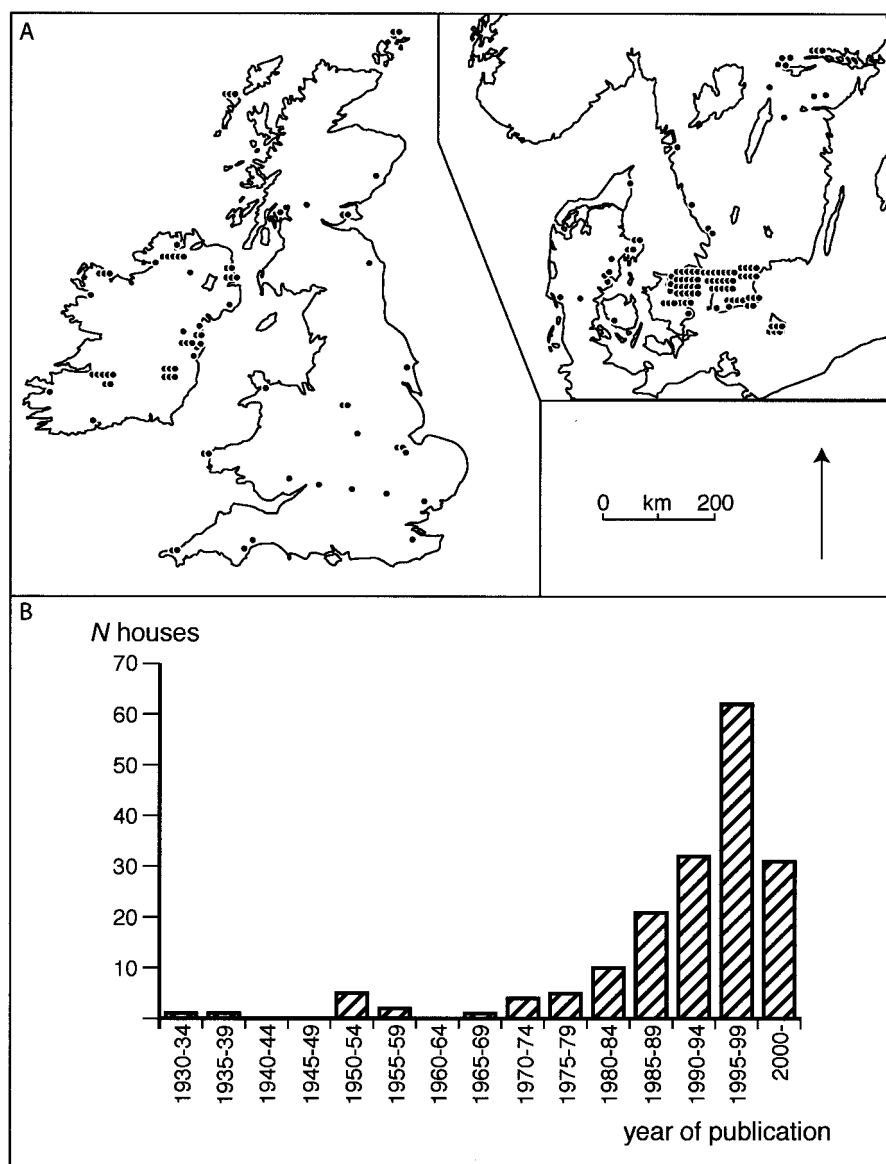


FIG. 5. A, locations of Early Neolithic houses in Ireland, Britain, Denmark, and Sweden. B, year of first publication of individual houses (see Rowley-Conwy 2003b:table 1 for details).

finds this suggestion “astonishing” (1991:9), but it is perfectly plausible. One of Britain’s largest Early Neolithic houses, White Horse Stone, was in fact found under several metres of hillwash (Oxford Archaeological Unit 2000:453).

Even more telling is method of excavation, as recent work in Sweden shows (Artursson et al. 2003). Research excavations tend to employ long, narrow reconnaissance trenches; these are widened when a site is encountered, but this widening ceases when artifact density decreases. A few Early Neolithic houses have been discovered by this means, but sites generally consist of small scatters of pits and artifacts. From this has come the impression that Neolithic settlements are small, around 400–800

m², and houses are elusive. In Britain too, archaeologists are optimistic that Neolithic settlements can be understood by this method (e.g., Evans and Knight 2000:94).

The antidote to such optimism is Stora Herrestad in Sweden (fig. 6, A). A research project tested the area in 1984 using 3-m parallel trenches with 10-m spaces in between, widened when houses were encountered; no Early Neolithic structures were found (Tesch 1992:fig. 11). Yet when electrification of a railway necessitated area excavation in 1995, a 17-m longhouse of transitional Early/Middle Neolithic date was revealed adjacent to two of the earlier trenches (T. Andersson 1997). Area excavation also reveals that Early Neolithic settlements may consist of several functionally distinct areas, each

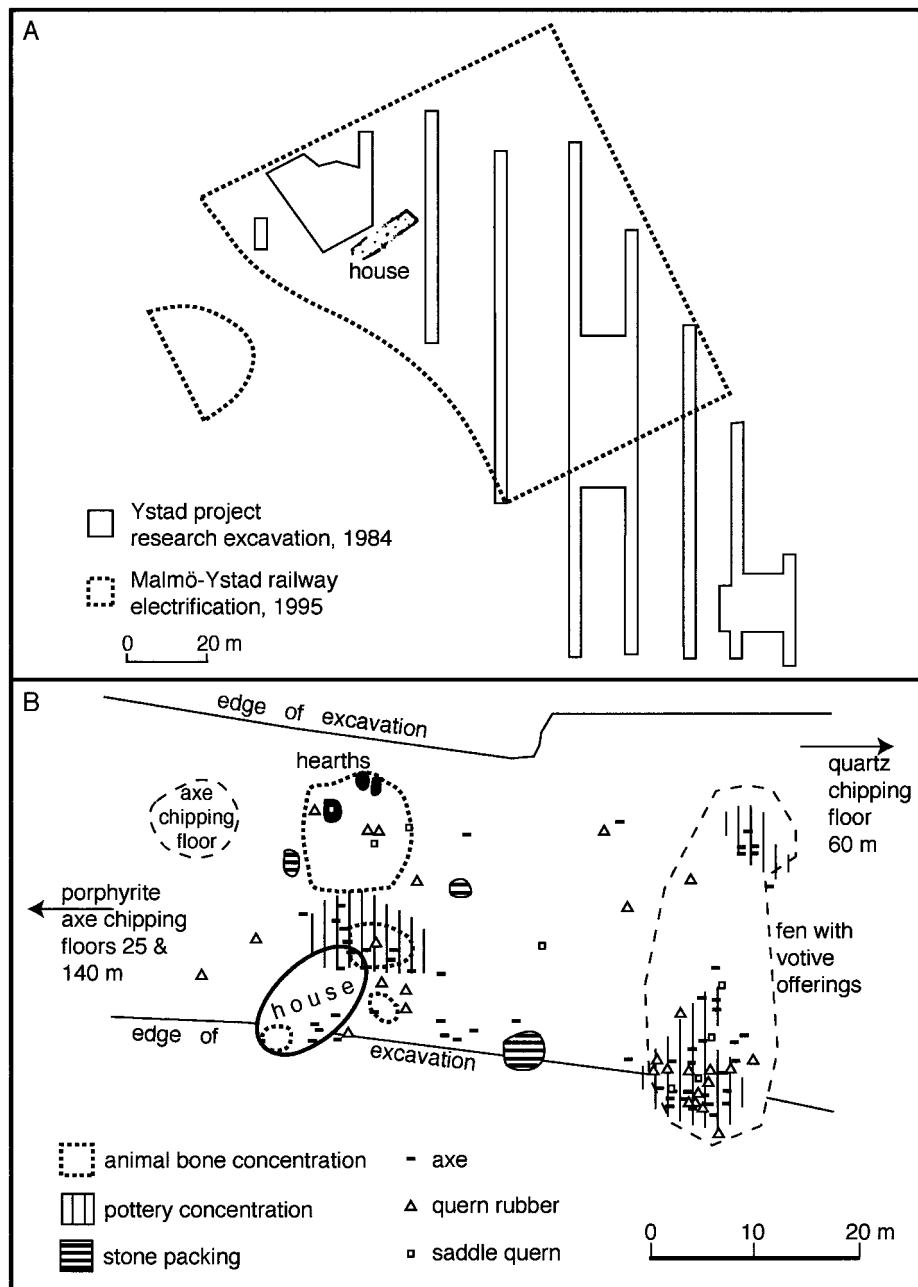


FIG. 6. A, *Stora Herrestad*, showing the position of the transitional Early/Middle Neolithic house and the excavation trenches (combined and redrawn from *Tesch 1992:fig. 11* and *T. Andersson 1997:figs. 3 and 4*). B, plan of the *Skogsmossen* settlement, showing the various activity areas (combined and redrawn from *Hallgren et al. 1997a:figs. 2a, 9b, 11a and b, 17; Hallgren and Possnert 1997:fig. 1; Hallgren et al. 1997b:fig 4.17*).

creating an artifact scatter of limited size, and therefore some settlements are much larger than is normally supposed (*Artursson et al. 2003*). *Skogsmossen*, from the northern edge of Early Neolithic farming in Sweden, is a good example (fig. 6, B). An open-air cooking area of hearths and bone debris lay north of a 12.5 × 6-m house; three areas of stone packing formed an arc within which

all but two of the axes were recovered, though all the saddle querns lay outside it; to the east was a small fen containing votive offerings, and various stone-working areas were encountered. The excavators estimate the total area of the settlement at between 30,000 and 45,000 m² (*Hallgren et al. 1997a:100*).

The distribution of houses (fig. 5, A) is largely an ac-

cident of research. Irish gas pipelines and motorway construction have produced many. Southern Swedish railway and pipeline construction and urban development round Copenhagen have supplemented major research projects to produce a high density of finds. Central and southern England, the “home ground” of much of the current consensus, has a reasonable scatter. There are fewest in northern England and southern Scotland, perhaps symptomatic of the lack of modern economic development and construction in this region. Early Neolithic houses are now so common that claims of their rarity and non-domestic nature can no longer be sustained; they cannot all be unoccupied stores for ritual use. Middle and Late Neolithic houses are even more common. The residential house must be restored to the centre of our understanding of Neolithic settlement in Northwestern Europe. These houses are not Central European-type longhouses, and more than two or three are not usually found together, but their ubiquitous domesticity cannot be denied.

Coppicing is a form of woodland management: a tree is cut down, and from the stump several new shoots rapidly grow. The aim is to produce timber of uniform growth. Shoots up to 6–8 years old are suitable for non-supporting house walls and partitions (the “wattle” of wattle and daub), for hurdles to construct fences and animal pens, and for items like fish traps. Some poles may be left to grow for 20–30 years if intended for house construction. If coppiced wood is preserved archaeologically, it can be recognized by a series of characteristic features (Coles 1987:152–54).

Several finds are known from Neolithic Northwestern Europe. In the Somerset Levels, the Sweet Track is a wooden trackway some 1,800 m in length. Its construction has been dated by dendrochronology to 3806 BC (Hillam et al. 1990), very early in the Neolithic. In addition to larger timbers, its construction required some 6,000 pegs 3–8 cm in diameter and 60–210 cm in length (Coles and Orme 1984:13). Eleven-year old hazel was favoured, and this and other species were coppiced, albeit rather unsystematically (Morgan 1984). Many coppiced hazel rods were found at Etton (Taylor 1988), and an Early Neolithic hurdle from Carr House Sands was probably made of coppiced hazel (Huntley 1997). In Denmark, coppiced hazel was used for a Middle Neolithic trackway at Tibirke (Malmros 1986) and for a fish trap at Oleslyst dated to 3200 BC (Christensen 1997). In Ireland, Early Neolithic and later trackways at Corlea were made of coppiced hazel (Moloney 1996).

Coppicing is important because it implies sedentism (Tomii 1996). Browsing mammals find the young shoots tasty, so areas of coppice must be fenced (requiring even more coppice) and patrolled to keep out deer and wild boar. A group returning after an absence would be unlikely to find its coppices intact. The potential depredations of animals and other people require continuous presence that cannot be reconciled with a nomadic settlement pattern.

In summary, the Neolithic was neither nomadic nor dependent mainly on wild foods. There must have been

local variability in settlement and subsistence, but the archaeological record remains rather coarse-grained and reveals surprisingly little variation; there is at the moment no reason to single out any one area, for example, southern England, as different from the others. The various lines of evidence presented above reveal a sedentary Neolithic that acquired the majority of its food from agriculture. Agricultural clearings were probably small and scattered but must have represented substantial infrastructural investment. Quite apart from the felling and clearing of forest, each would have contained one or more houses and small but intensively cultivated fields. In time, mantle vegetation would have grown round the edge, providing nuts and fruits. Animals were kept close to the settlement. Cattle, probably in fairly small numbers, were intensively managed for dairy products in Britain and for meat in Denmark. Pigs foraged on and around the settlement; because little interbreeding with wild boar took place, it is apparent that they were not extensively run in the forest (Rowley-Conwy 2003a). This required yet more infrastructure: fencing to keep them out of the cultivated fields, an important feature in contemporary societies keeping pigs like this (Steensberg 1980: 111–23). Substantial areas of coppiced woodland were needed. The ard, requiring dedicated oxen, soon supplemented the digging stick; field size and agricultural production increased. Wild animals and plants were exploited but only as minor supplements. Axiom 2 of the current consensus is therefore not supported.

A Seamless Transition?

Axiom 3 is that local Mesolithic groups chose gradually to adopt agriculture. The slow economic transformation was thus an internal development within a cultural continuum.

Indigenous agricultural adoption is almost universally accepted. The slow economic change envisaged by the current consensus implies unbroken cultural continuity, the only rapid change being the start of monument building. According to Thomas (1996b:317),

Areas such as Britain, Ireland and southern Scandinavia were not “acculturated” by existing agricultural populations: their mesolithic groups actively chose to engage in new networks of contact and new social and economic practices . . . [so agricultural origins consisted of] judicious adoption of aspects of what the neolithic had to offer.

This empowers local Mesolithic groups, making them the determining factor in the appearance of agriculture. This view goes back farther than just the past 15 years, however: local development was a major tenet of the “new archaeology” (e.g., Higgs and Jarman 1969), and the view can be traced to an epoch-making paper by Grahame Clark (1966). It may not be a coincidence that this view arose while Britain was divesting itself of its imperial colonies, a process which was empowering indig-

enous peoples and re-emphasizing their cultural continuity and autonomous choice.

The empowerment of the local group as the decisive factor in agricultural origins has questionable implications, however. The arguments for Late Mesolithic intensification towards agriculture imply that these groups were economically progressive. They were not yet agricultural, however, although other groups in Europe were. Thus all groups are seen as progressing in parallel, but some are ahead. Exotic agricultural items such as sheep and wheat are passed on when the next group has entered the *domus* stage of development and can take them on. This is the essence of seamless continuity.

But, as we have seen, the change in subsistence economy did in fact happen very rapidly. This can be elucidated using the model developed by Zvelebil and Rowley-Conwy (1984, 1986), which identifies three phases in the transition: the availability phase, in which agriculture is available to hunter-gatherers but plays little or no role in their economy; the substitution phase, in which agriculture provides 5–50% of the diet; and the consolidation phase, in which agriculture provides over 50% (see fig. 7, A). The substitution phase is the actual transition, and it is this that was so rapid in North-western Europe. This is not unexpected, however. Hunn and Williams (1982) chart the economic practices of 200 ethnographically known societies. The percentage dependence on gathering (fig. 7, B) shows that many societies do not depend on gathering at all. Some societies depend on it for moderate proportions of their diet, while very few are highly dependent. The result is a regular fall-off curve. Hunting, fishing, and herding show similar patterns. Dependence on agriculture reveals a completely different pattern. Some societies make little or no use of it; these are the hunter-gatherers. Many others depend upon it for 45% or more of their diets, but remarkably few societies depend upon agriculture for between 5 and 45% of their diet. “Apparently people either depend upon agriculture to a negligible extent or they depend heavily upon it” (Hunn and Williams 1982:5). This suggests that, other things being equal, the 5–50% zone of the substitution phase is an unstable intermediate area through which transitional societies are likely to move rapidly. The data may even exaggerate the frequency of groups in the 5–50% zone; many are hunter-gatherers in contact with farmers and acquiring some agricultural practices from them (Blumler 1996:36), and therefore their numbers have probably been inflated in the past two or three centuries.

The scale and rapidity of the economic transition force us to reconsider the idea of seamless cultural continuity. The whole economic change took at most a century or two, and it was the biggest single upheaval that North-western Europe has ever undergone. Agriculture was an economic juggernaut moving fitfully across Europe and overwhelming previous ways of life. Sometimes it stopped for centuries at a time, and sometimes it moved so fast that we cannot track it with current dating methods, but ultimately it proved unstoppable until it reached the Atlantic.

For the Mesolithic, the arrival of agriculture was an unforeseeable contingency, and the upheaval it caused must have been huge. For the successful reproduction of local forager descent groups, agriculture must have been a catastrophe. It is almost inconceivable that any socio-ethnic groups survived intact across the transition. Major movements of people were probably frequent. This is not to suggest a return to the demic “wave of advance” suggested by Ammerman and Cavalli-Sforza (1971:687); movements were probably much shorter and less directional. Several scenarios can be envisaged, among them “leapfrog” migration, taking a group or subgroup just beyond its neighbours into available space, “trickle” migration, involving movement by individuals, not necessarily of one ethnic group, over periods of a generation or more, and “creep” migration, so slow that it may scarcely be discernible within a human generation. Work on the DNA of modern Europeans has shown that most of us are descended from Mesolithic hunter-gatherers, leaving room for only a modest immigration from Asia in the Neolithic (Sykes 2001). But this work cannot focus closely enough to reveal the type of movements suggested here. Most of these movements would have been by hunter-gatherers or the descendants of hunter-gatherers. European mtDNA lineages would thus remain largely intact, but nothing else would.

Migrations of the kind considered here are in fact making an explanatory comeback in various parts of Europe. The agricultural expansion round the West Mediterranean coast is a good example (Binder and Maggi 2001, Zilhão 2001), and population movements have been suggested in Britain (Sheridan 2003) and southern Scandinavia (Skak-Nielsen 2003). For Ireland, Cooney (2000:13) points out that the domestic cattle at Late Mesolithic Ferriter’s Cove are unlikely to be there because of “a [Mesolithic] propensity to take on the importation and management of unfamiliar domestic animals”; the people who owned the cattle seem more likely carriers (unless the bones arrived in joints of preserved meat).

The appearance of agriculture was thus not a demic “wave of advance” but rather a rapid and massive socio-economic “wave of disruption.” Axiom 3, the seamless transition, is not sustainable.

Conclusions

The three axioms of the current consensus have been examined and found to be incorrect: (1) The Mesolithic was *not* intensifying towards a native agriculture. (2) The Neolithic was *not* mainly dependent on wild foods and was *not* nomadic. (3) The transition was *not* seamless but highly disruptive. Deconstruction of the post-processual agenda has revealed that subsistence economy and ideology had to be decoupled. In the claimed absence of abrupt subsistence change, ideology thus became the default explanation for abrupt cultural change—the building of monuments and the emergence of the Neolithic “structure of ideas.” As noted in the foregoing, objections have been raised by Scottish and Irish ar-

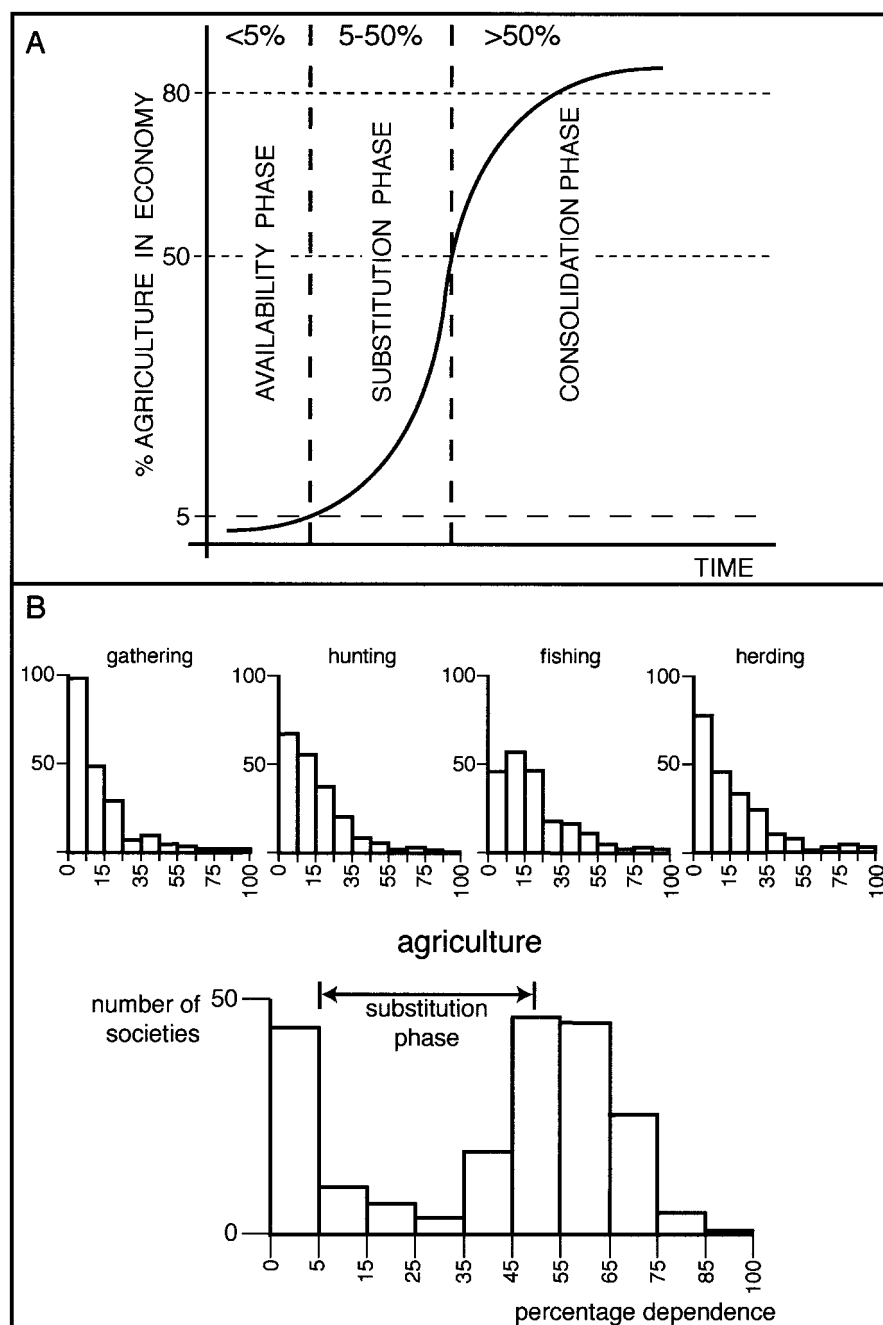


FIG. 7. A, phases of the transition identified by Zvelebil and Rowley-Conwy (1984); the S-shaped curve represents the proportion of agriculture in the subsistence economy. B, economic reliance on gathering, hunting, fishing, herding, and agriculture in a sample of 200 ethnographic societies (modified from Hunn and Williams 1982:fig. 3).

chaeologists, by archaeobotanists, and by isotope specialists, but these voices from the Celtic and scientific fringes have not had a great impact on this notion.

The need to decouple subsistence economy and ideology is, however, the central fallacy of the current consensus. The overarching theoretical claim is the primacy

of ideology, which permeates and contextualizes all aspects of life—and yet the economy is dealt with in a completely contrary way. The domesticity of cereal cultivation, domestic livestock, arid marks, and houses has been denied. It seems that if settled agriculture can be lifted out of the domestic context and placed in a ritual

one instead, this somehow makes it “different”; but of course the nutritional value of bread and cheese does not change as a result. A further implication is that the claimed (but archaeologically invisible) wild subsistence base is the “real” domestic economy because no ritual context is argued for it. Ideology has thus been taken out of the domestic social context—a remarkable achievement for an approach that sometimes labels itself “contextual archaeology.”

Advocates of the current consensus have painted themselves into a corner from which there is no escape by theoretical means. Richard Bradley once memorably remarked that writings on the Mesolithic and Neolithic gave the impression that “successful farmers have social relations with one another, while hunter-gatherers have ecological relations with hazel nuts” (1984:11). This oft-quoted thought-byte tells only part of the story, however. In essence, the Mesolithic has been treated as a way of life and livelihood, the Neolithic as a way of death and ritual. We must, however, accept that the Neolithic too had a domestic way of life and that we have many data casting light upon it. We must reincorporate these data into our thinking and make them the starting point for our theorizing. As demonstrated above, this generates a very different picture of the past. Until this is accepted, Neolithic studies will remain in the theoretical limbo in which they currently languish.

Comments

PABLO ARIAS

*Instituto Internacional de Investigaciones
Prehistóricas de Cantabria, Santander 39005, Spain
(pablo.arias@unican.es). 13 VI 04*

Research on the introduction of the Neolithic into Europe seems to be entering a Kuhnian phase of collapse of a consensual model because of its inability to integrate new data. As Rowley-Conwy stresses, the radically indigenist narrative developed in the 1980s and '90s (see Ammerman 2002), in which subsistence is considered as almost irrelevant compared with ideology, needs profound revision.

Curiously, a central point in the discourse of this post-processual approach is in fact a legacy of the New Archaeology (especially of its British branch): the understanding of domestication as just one option from among a broad range of relationships between human society and animal or plant species. This is undoubtedly one of the bases of the idea of a gradual change from foraging to primitive agricultural systems. If the differences between the economic systems fade and are finally considered irrelevant, it is logical to look for the source of the Neolithic elsewhere. While the post-processual approach inverts the causal agent, the basic concepts are provided by the New Archaeology—which, incidentally, may help to explain the apparent paradox of the success

of this model among scholars hardly suspected of affection for post-processualism.

Therefore, a key point is whether intermediate situations between foraging and agricultural systems really exist or are simply wishful thinking. This is not, however, a simple question to answer. It may be easy to establish whether cereals were cultivated, but it is difficult to understand their importance in the diet and in the economy as a whole and their articulation with other aspects of social life. Similarly, the issue of the mobility of Neolithic groups may not be resolved by a somewhat simplistic nomadic/sedentary dichotomy. Furthermore, because of the contingency of material culture the interpretation of the data may not be as straightforward as is often assumed. The only possibility of a way out is independent verification. Paleodiet studies, for example, are currently providing data that will probably produce a major change in our knowledge of the transition to the Neolithic in Atlantic Europe. From Denmark to Portugal, stable isotope analyses show a consistent pattern of association of the beginning of the Neolithic with a sharp and rapid change in the diet (Richards, Price, and Koch 2003; Richards, Schulting, and Hedges 2003; Schulting and Richards 2001, 2002a, 2002b; but see Lidén et al. 2004 for a different situation in southern Sweden).

Rowley-Conwy wisely combines these new data with an extensive analysis of more conventional archaeological information (including firsthand familiarity with the Scandinavian record) and a sharp methodological critique of some of the excesses of the post-processual view. The result is, as a whole, extremely convincing, and I think that this paper will be an important reference for a long time. Yet, it would have been interesting to see him exploring the implications of his view of the introduction of agriculture a little further.

The new scenario that he proposes for the northern part of the Atlantic fringe of Europe may in fact have occurred at the opposite end as well. On the Atlantic façade of the Iberian Peninsula, it has frequently been argued that the introduction of domestic species (especially cereals) was very late, but the results of the research of the past ten years seem to be highly consistent with Rowley-Conwy's proposal for the northern Atlantic in its three main points.

Hunter-gatherer intensification has not been clearly demonstrated, even in regions such as the central and southern Portuguese coast (Araújo 2003); the clearest shifts seem to be related to territoriality rather than to complexity (Arias and Alvarez n.d.). In any case, the “broad-spectrum” Mesolithic economy seems to have been more a response to shortage than an ecologically sustainable adaptation. Moreover, there are now signs pointing to a rapid and profound change even in areas less well-suited to cereal-based agriculture such as the Cantabrian region and Galicia. The application of flotation techniques has revealed the generalized presence of cereals since the early Neolithic (sixth or early fifth millennium, depending on the region), although some data (on harvesting without sickles [Ibáñez et al. 2001]) suggest that it was on a small scale. At the same time, archaeo-

zoological studies have revealed, even in the north, percentages of domestic fauna of over 50% in contexts of the early fifth millennium cal BC (Arenaza, El Mirón). Indirect data show evidence of dairying in the first half of the fourth millennium cal BC (remains of butter in Dombate), proving that, as in the Mediterranean basin (Rowley-Conwy 2000, Vigne 2003), some animal “secondary products” were already used. Finally, carbon and nitrogen stable isotope values (so far obtained for Portugal and the Cantabrian region) also seem to confirm the existence of a sharp change in diet between the coastal hunter-gatherers and the first Neolithic groups, although in the north of Spain the evidence for the latter is still insufficient.

In short, we are in for some very interesting times in the study of the Neolithic on the Atlantic edge of Europe. The need to include the new data will require significant adjustments to our present explanatory models and the drawing of new and more realistic conclusions. It is to be hoped that these new perspectives, of which Rowley-Conwy’s present work is an excellent illustration, will succeed in integrating many topics introduced into the debate by the post-processual agenda. Approaches like this are not necessarily incompatible with concern for the role of ideology or the complexity of individual existence and identity.

MIHAEL BUDJA

Department of Archaeology, University of Ljubljana, 1000 Ljubljana, Slovenia (miha.budja@uni-lj.si).

18 v 04

Despite many years of modern investigation into the transition from mainly hunter-gatherer (Mesolithic) to farming (Neolithic) societies, it remains an intensively discussed topic. It is stimulating that comments on processual and postprocessual theoretical views of the transition to agriculture have replaced the debate between diffusionists and indigenists. This paper discusses the ideological and subsistence dynamics and the current interpretations of their correlation that have, as is suggested, achieved axiomatic status in postprocessual views of the transition in north-western Europe.

It is indeed important to draw attention to the constraints on interpretations of the transition to farming. The first, on an epistemological level, is that we are dealing with processes which cannot be directly observed. The second restricts the empirical importance of explanations from actual ideological contexts. With regard to “middle-range theory,” besides taphonomic filters we must not overlook the loop that can be described as “double discontinuity” (Klejn 1982), the discontinuity between the past and the present and between the material world and the world of ideas, both of which limit the value of archaeological explanation.

Rowley-Conwy reexamines the theoretical and interpretative postulates and available data on palaeoeconomy, palaeodiet, and “cultural continuum” in northwestern Europe and finds the current decoupling of subsistence economy and ideology weak and the related postprocessual

axioms about the transition to farming incorrect. His comments on Thomas’s model of change in economy and material culture are directed at the premise that fundamentally new socioeconomic systems appear during periods of dramatic cultural change and that stress can be considered as a trigger for cultural diversification (see Prentiss and Chatters 2003). Paraphrasing Ammerman and Cavalli-Sforza’s “wave of advance,” he offers an idea of *how* it happened. He believes that it was catastrophic for local forager groups and none survived it intact. The appearance of agriculture is recognized as a rapid and massive socioeconomic “wave of disruption” driven by major and frequent movements, local or (inter) regional, of hunter-gatherers or their descendants. However, it is broadly accepted that there was a stagnant period of 800–1,300 years in the adoption of agriculture in southern Scandinavia, the British Isles, and Ireland compared with neighbouring regions of continental Europe. In the mid-1980s this delay was attributed to a stable maritime-based hunter-gatherer palaeoeconomy (Zvelebil and Rowley-Conwy 1986). Why did the transition to farming happen when it did, and were hunter-gatherers in Britain and Ireland aware of domesticates and novel cultural characteristics before 4000 BC? No answer to this question is offered.

It has recently been hypothesized that a shift to a more continental-type climate shortly after 4100 cal BC, with lower winter precipitation and, less critical, higher summer temperatures, facilitated the adoption of agriculture by indigenous hunter-gatherers in the British Isles and southern Scandinavia by increasing cereal yields and thereby improving the agricultural potential of large areas (Bonsall et al. 2002, Bonsall, Anderson, and Macklin 2002). On the North European plain and in Scandinavia, however, it seems that hunter-gatherers were highly selective as to which elements of the Neolithic “package” they adopted from the Bandkeramik farmers to the south.

In this respect, it would be instructive to contrast the regions within the Atlantic seaboard of Europe (southern Scandinavia, the British Isles, and the western Iberian Peninsula), on one hand, and to compare the “Atlantic halts” with the two that have been hypothesized in the Carpathian Basin and on the tip of Balkan Peninsula, on the other. It is not that these “halts” showed either that hunter-gatherers had to become “domesticated” and the regions “acculturated” or that the cereals had to adapt to new environments but that the intensive nature of mixed farming was traceable there from the very early Neolithic (Bogaard 2002, 2004). We also should not overlook the regional variability in the genetic palimpsest and different values in incoming Near Eastern lineages that are indicated by mitochondrial DNA analysis. Regional analysis shows the Neolithic contribution—the incoming lineages with the values of ~20% for south-eastern, central, northwestern, and northeastern Europe. In the Mediterranean coastal area it is even lower than ~10%, similar to that in Scandinavia (Richards and Macaulay 2000:139–51; Richards 2003:159–67).

The next challenge will be to analyze the relationships of changes in economy and material culture in the context of transitions from the Natufian varieties of subsis-

tence, material culture, and monuments to those of the Neolithic in the eastern Mediterranean.

DETLEF GRONENBORN

Römisch-Germanisches Zentralmuseum, Abteilung Vorgeschichte, Ernst-Ludwig-Platz 2, D-55116 Mainz, Germany (gronenborn@rgzm.de) and Johannes-Gutenberg-Universität Institut für Vor- und Frühgeschichte, Schillerstr. 11, Schönbörner Hof-Südflügel, D-55116 Mainz, Germany (gronenbo@uni-mainz.de). 25 v 04

This article is one of a number of recent assessments on the rather curious results of postprocessual theorizing on Neolithic phenomena. General critiques of a number of issues have been expressed before (e.g., Lüning 1999, Whitley 2002), and critiques on the specific topic of the transition to farming in northern and northwestern Europe have appeared more recently (e.g., Cooney 2003). As a Central Europeanist archaeologist, I find a number of topics discussed by Rowley-Conwy similar to those being debated in the circum-Danubian world.

These similarities begin with the omnipresent but strikingly old-fashioned debate between “migrationists” (introduction of agriculture attributed to immigrating groups) and “diffusionists” (farming adopted by local hunter-gatherers). The two concepts have enjoyed mutually exclusive popularity. Many postprocessualists working on the Neolithic have largely dismissed migration as an explanatory concept for Central Europe (e.g., Whittle 1996), but for this area in particular any debate about migration versus diffusion must be considered long outdated simply because the archaeological evidence for a combined scenario has been overwhelming for years and continues to grow (Gronenborn 1999, 2003; Bentley et al. 2003). Despite this, some scholars still adhere to ideas of a massive migration (e.g., Bogucki 2003), and others again insist on diffusion and local adaptation as the only plausible explanation (e.g., Tillmann 1993, Otte and Noiret 2001). Recent DNA analyses point to minor population movements and a considerable contribution of local adaptation (Richards 2003). Taking all of the archaeological and molecular biological evidence into account, both exclusionary concepts—massive migration and indigenous adaptation—have to be abandoned (I find the Indo-European-language debate fostered by Renfrew [1996, 2002] and, recently, Gray and Atkinson [2003] too vaguely founded for any serious discussion). Just as Rowley-Conwy suggests for the British isles, a combination of small-step migrations with comparatively small numbers of people moving into previously underexploited ecological niches (e.g., the loess zones of Central Europe) seems to fit best. Farming techniques then spread from these pioneer settlements to the neighboring indigenous groups, which gradually become acculturated until they are scarcely visible in the archaeological record. Thus, ideology does play a role in the spread of farming, but in contrast to what some colleagues would like us to believe,

it is closely tied to the incoming economy and the incoming people.

What has been equally contemplated by Central European scholars and is linked to the migrationist-versus-indigenist debate is the concept of an “intensifying Mesolithic.” For instance, Tillmann (1993) and Kind (1998) have proposed a trajectory toward increasing complexity in the later millennia of the Mesolithic. However, in Central Europe, too, these theoretical concepts have little to do with actual data. To date there is no archaeological evidence for complex hunter-gatherer societies apart from the Iron Gates region at the far southeastern margin of the region. What one might be inclined to infer from the disappointingly sparse evidence is a tendency towards sedentism and increased and intensified long-distance exchange (Gronenborn 1999). Whether the proposed but not proven spread of cereal horticulture during the seventh millennium cal BC (e.g., Jeunesse 2003) would have resulted in a sociopolitical shift is not evident from the currently available archaeological record, and the possible occasional keeping of wild boars in southwestern Germany (Steppan 1993) would not account for any increasing complexity. The only visible changes come with the appearance of La Hoguette pottery and a pastoral component in western Central Europe after 5800 cal BC, but even then population densities may still have been low, with equally limited political hierarchies.

The “foraging Neolithic” concept has not received any widespread attention in Central Europe, although we do know of regions and phases in which the proportion of game in faunal remains increases. This is, for instance, the case with the onset of the Middle Neolithic in eastern Central Europe (Jeunesse and Arbogast 1997). In the West, however, subsistence continued to be based on farming, just as during the LBK (Dürrewächter et al. 2003). When pondering the meaning of increases in wild fauna remains it might be more rewarding to think of climatically induced crises which made it necessary to shift to hunting for a time as cereal harvests became unpredictable or declined (Schibler et al. 1997). Interestingly enough, referring to an earlier work by Rowley-Conwy (1984), the spread of farming to northwestern Europe has recently again been linked to climatic shifts during the terminal fifth millennium cal BC (Bonsall, Anderson, and Macklin 2002).

I find Rowley-Conwy’s article convincing and helpful in reassuring non-British Neolithic archaeologists that some of the more curious ideas of postprocessual thinking are not shared by all U.K.-based scholars. His contribution and others may serve as a starting point for a refreshed discussion of culture change in which archaeological data will play a more respected role.

ANDREW JONES

Department of Archaeology, University of Southampton, Highfield, Southampton SO17 1BF, U.K. (amj@soton.ac.uk). 19 v 04

As a scholar whose theoretical outlook is firmly embedded in post-processualism, I find myself in the somewhat

peculiar position of agreeing with the greater part of Rowley-Conwy's argument. I owe this in part to the fact that much of my work has been conducted in the Northern Isles of Scotland, where a firmly sedentary Neolithic prevails.

This is not to say that I agree with the tone of the argument, which seems to set too much store by the distinctions between economy and ideology, domestic and ritual, and environmental archaeologist and interpretative archaeologist. Many of the conclusions depend upon the alleged decoupling of ideology from economy. Such a stance appears to perpetuate the perennial distinction between domestic and ritual which so hampers our understanding of prehistory. The need to maintain this distinction for the purposes of the argument seems to foreshorten many of Rowley-Conwy's conclusions. In brief, I believe that he does not take the argument far enough; after 15 years of post-processual debate we have returned to the point at which we began, the Zvelebil and Rowley-Conwy three-phase model of the agricultural transition. While Rowley-Conwy offers a thorough deconstruction of current orthodoxy, he does not incorporate some of the valuable insights that the past 15 years of interpretative archaeology have offered.

One of the most valuable of these is that the Neolithic was different. Not only did the adoption of agriculture effect a major change in cultural perceptions but this went hand in hand with the building of ceremonial monuments. The challenge is to integrate this understanding with the realization that economic change was relatively rapid. How were the first domesticates understood? Why does their adoption seem to be closely related to the use of novel material culture and the creation of monuments? These are questions which only a coherent approach examining monuments, settlement, material culture, and animals and plants in equal light can hope to answer, and they have preoccupied interpretative archaeologists for at least a decade.

In regions such as Orkney, where we observe upstanding stone-built settlement from at least 3600 BC, it is possible to provide such an integrated view. Richards (e.g., 1990) has demonstrated the cosmological and ritual significance of the house, while I have shown that material culture and (domestic) foods are equally functional/economic and socially significant (Jones 1999, 2002). I agree that the house should be returned to the centre of our understanding of Neolithic settlement in north-western Europe, but in the process we must be careful not to invoke "ubiquitous domesticity." Neolithic houses are anything but grindingly domestic, as a cursory reading of the ethnographic literature shows (see also Whittle 2003). The opposition between domestic and ritual is an artefact of the Reformation, and it is unhelpful to continue to apply it to past cultural contexts.

Rowley-Conwy is correct to question the dominance of a shifting-settlement model for the Neolithic and the allied supposition that this means wild foods. There is no reason to suppose that Neolithic settlement throughout Britain and Ireland was the same. As he notes, both

Cooney and Barclay have been at pains to point this out for Ireland and Scotland. Equally, Cooney (2000) makes the valuable point that even within Ireland we should not expect uniformity of settlement, monumentality, and landscape use. That there are problems with the wholesale adoption of the "Wessex" model of transitory settlement need not mean that it does not apply for some areas.

Probably the most striking proposition here is that the transition was relatively rapid and likely to have been accompanied by migration. The disruptive nature of this change will repay closer investigation, and we need to reconsider how we think about migration. Rowley-Conwy overlooks the strontium and oxygen isotope analysis conducted by Douglas Price and Alex Bentley for LBK populations (Bentley et al. 2002, Price et al. 2001), which indicates population movement but also complex interactions between migrants and indigenes. The "wave of disruption" invoked by Rowley-Conwy evidently involves social interaction, and it is the nature of this interaction that is of crucial importance. The literature on the role of material culture in colonial interaction is of immense value here (e.g., N. Thomas 1991, Gosden and Knowles 2001). We need to move toward a view in which the social relations of interaction across "border zones" are central. We need to adopt Gosden and Knowles's helpful proposition that in interactions of this kind we should expect to observe change in both the colonizer and the colonized. This is the kind of thing we ought to be able to pick up through study not only of the presence/absence of agriculture, material culture, or monuments but of the social practices in which they are involved.

Neolithic studies are on the verge of yet another revolution in thinking. This paper offers an important critique of current approaches, but the author is in danger of returning to the bad old days of economic determinism. Ideology can never be decoupled from economics, and a proper study of the Neolithic requires that equal weight be given to both.

LEENDERT P. LOUWE KOOIJMANS
Faculty of Archaeology, Leiden University, P.O. Box
9515, 2300 RA Leiden, The Netherlands (l.p.louwe.
kooijmans@arch.leidnuniv.nl). 1 VI 04

I fully agree with the main issue of this paper, namely, that an "academic elite" has emerged in British archaeology in the past 15 years or so that has focused more on explanation from a post-processual or contextual theoretical viewpoint than on the constraints established by the factual evidence. The resulting dichotomy between the more conventional archaeologists and academic archaeology has not, however, troubled non-British archaeologists much, since the work is focused mainly on the British situation. A few, such as Whittle in his reopening of the old debate on a possible *Wanderbauerntum* of the Linearbandkeramik (LBK), have extended this approach to the continent, but few prehis-

torians have joined this senseless debate: if *any* Neolithic community was permanently settled it was the LBK!

I also agree with the arguments against Mesolithic intensification, even for Denmark, but this does not mean that the Late Mesolithic communities were not susceptible to the new opportunities offered by farmers. It is true that high-resolution data on the Late Mesolithic are concentrated in southern Scandinavia and that the European Late Mesolithic is treated like a clone of it. The new evidence from Hardinxveld in the Rhine Delta (Louwe Kooijmans 2003) demonstrates, however, a comparable way of life: seasonal sedentism and the option of a distinct territoriality and a contact network more than 150 km in extent as documented by raw materials. In addition, cultivation and/or protection of special resources can be assumed as an aspect of a native knowledge system, heavy and sophisticated woodworking was practised in the building of dugout canoes, and domesticates had been known for millennia in the form of the dog. Yes, this way of life contrasted markedly with that of the Linearbandkeramik, with which it had been confronted ca. 5300 cal. BC, but these communities can be conceived as the prototype of a fully domestic community in the sense of Hodder, fully focused on a self-created domestic world in the wilderness. At the same time, the Late Mesolithic should not be conceived as completely "wild": it was more settled and domestic than one might conclude from the traditional flint scatters. And yet the response to the LBK "input" was very reserved; the hunter-gatherers' adoption of Neolithic traits took more than 1,000 years—(point-based) pottery (5000 cal BC), imported perforated stone wedges and long flint blades (ca. 4800 cal BC), domestic animals (ca. 4500 cal BC), all four in low percentages, and a semi-agrarian subsistence economy with cereals and domesticates > 50% (4100 cal BC). A very similar sequence has recently been documented by Hartz, Heinrich, and Lübke (2002) for the German Baltic coastal area.

All this demonstrates, first, that a view of the Neolithization of north-western Europe should include the continental fringe to the north of the Belgian-German Bandkeramik and its successors. Britain and Denmark cannot be understood in isolation. Second, it shows that fundamental new evidence that changes our perspective remains to be discovered, possibly in Britain as well. Third, it demonstrates the importance of chronological resolution and a sound chronology, which is the main tool for documenting processes and essential for producing possible explanations. Last but not least, it opens our eyes to the very differentiated course of the transition—the rapid spread of the Bandkeramik as opposed to the more gradual extension across France in the fourth millennium and the long-term static frontier in the north. Most remarkable, however, is the complete lack of evidence for continental contacts previous to ca. 4000 cal BC: no broad blade trapezes, no antler T-axes (except for two in Scotland), no *Breitkeile*, no slate bracelets such as those typical for the continental and north-western French Neolithic of this period. Did the British know what was going on on the continent? What do we know

about the phasing of change in the crucial centuries between, say 4300 and 3500 cal BC in Britain? How much time was involved in the Neolithization process, and in what sequence were the various aspects adopted? Was it as a complete package or a matter of choice from a "repertoire"? Thomas's graph certainly does not represent reality, but it is (at any rate, for an outsider) not easy to obtain a well-documented overview, and this makes one suspicious of all "explanations," even contextual ones such as Rowley-Conwy's proposal of a "rapid and massive socio-economic wave of disruption." Agriculture by itself may not have been as disruptive as its demographic and hierarchical effects. It may very well be that pioneer settlers came leapfrogging, trickling, or creeping in, rapidly increased in numbers in their frontier situation, in the meantime absorbing and acculturating the surrounding hunters, *and* expanded across the whole of Britain. I would love to see this supported by patterns in the archaeological data.

POUL OTTO NIELSEN

Danish Prehistoric Collections and Environmental Archaeology, National Museum of Denmark, Frederiksholms Kanal 12, DK-1220 Copenhagen, Denmark (poul.otto.nielsen@natmus.dk). 21 v 04

For 150 years or more, Danish archaeologists have been discussing the transition from foraging to farming (Fischer and Kristiansen 2002), and this is not the first time that Rowley-Conwy has added a contribution to this discussion. In 1984 he and Zvelebil presented a model for gradual change through three stages—the "availability phase," the "substitution phase," and the "consolidation phase"—as a plausible conceptual frame of reference. The next year he published a review of theories in which he referred to the environmental change towards a colder climate around 4000 BC, causing a decline in marine resources and thereby affecting part of the subsistence base of the Ertebølle hunters and gatherers in southern Scandinavia. This situation, he suggested, might have provoked an awakening interest among hunter-gatherers in the availability of agriculture, which at that time was being practiced in neighbouring northern Germany (Rowley-Conwy 1985). Then and now, he has shown more interest in inspecting the circumstances, using the archaeological and environmental data, than in following the current mainstream of archaeological theory. Since 1985, excavations of shell middens at coastal sites in Jutland have added to the evidence on the change in marine resources ca. 4000 BC, when there was an abrupt decline in the gathering of oysters possibly due to a lowering of the tidal range that resulted in more brackish water in the Danish fiords (S. H. Andersen 2000:375; Petersen 1993). This event coincided with the appearance of the first Neolithic pottery and lithic tools in the layers of the shell middens.

There is ample evidence of the continued use of coastal as well as inland sites for hunting, fishing, and gathering during the first part of the Early Neolithic period, ca.

3950–3500 BC. Later occupation of such sites is less frequent. Wild resources were therefore exploited by the first farmers, who seem to have enjoyed a variable diet. Was the primary food supply based on hunting, fishing, and foraging even after the introduction of agriculture? The shift from a marine to a terrestrial diet at the transition from the Mesolithic to the Neolithic has long since been demonstrated by analyses of the ^{13}C content of human bones (Tauber 1983). Therefore, we can at least rule out a continued dependence on marine resources. The number of sites suitable for hunting and foraging is also limited compared with the inland settlements with indications of agriculture. Why, then, do some prehistorians emphasize the importance of natural resources during this time? It may be because the archaeological finds from coastal and lacustrine sites are often more abundant and better preserved than those from inland settlements, which usually provide us with less substantial material because of their exposure to later cultivation and erosion. Considering the radical change in settlement pattern from coastal to inland occupation which took place all over southern Scandinavia during the first centuries of the Neolithic, it is evident that the focus was more on cultivation than on hunting, fishing, and foraging.

Important evidence for simultaneous agricultural activity and grazing of domesticated animals during the first centuries of the Neolithic over a large part of northern Europe is supplied by the growing number of pollen diagrams indicating burning of vegetation and the advent of cereal cultivation during the time interval ca. 4000–3800 BC (e.g., Berglund 1991:69; Odgaard 1994:154–55). It is a striking fact that animal husbandry extended as far north as Uppland in eastern central Sweden during this initial stage of the Neolithic (Malmer 2002:24–25 with references). The way in which the northern group of the Funnel Beaker culture expanded ca. 4000–3800 BC can be compared with the rapid colonization of the loess area of Central Europe by the Linear Pottery culture ca. 5500 BC. The physical evidence contradicts the “consensus” that this process was slow and gradual. There is reason to believe that the impact of the new exploitation of land and the possession of livestock also caused multiple and complex changes within the society (see Nielsen 1987).

LAWRENCE GUY STRAUS

Department of Anthropology, University of New Mexico, Albuquerque, NM 87131, U.S.A. (lstrauss@unm.edu). 14 v 04

Rowley-Conwy's *tour d'horizon* represents a reasoned appeal to archeological common sense in the interpretation of the Mesolithic-Neolithic transition in north-western Europe. The postprocessualist emphasis on ideology has led some archeologists to deny the obvious about the revolutionary nature of the appearance of Neolithic lifeways. No doubt it represented an initially justifiable reaction to the perceived exclusively economic/materialistic explanations of the processualists, but cer-

tain theoreticians have thrown the proverbial baby out with the bath water. While it is obvious that *Homo sapiens sapiens* has always made sense of the world and other people in socially and ideologically constructed ways (Binford 1962), it is equally clear that humans survive by extracting energy from nature. To minimize the importance of the economy in human adaptation in favor of an ideational perspective on the remote past is, in my opinion, to put the ard before the ox.

Rowley-Conwy makes a very convincing case that—at least in some of the agriculturally peripheral regions of Europe—the transition was a rapid economic “revolution.” I agree with him and suggest that the changed ideological “superstructure” and new social arrangements mainly *followed* the subsistence shift, albeit probably very quickly. What I find hard to understand is why archeologists would choose to ignore the material facts to support grand ideational theories. While it may be that “man does not live by bread alone,” without sustenance his ideas and relationships will not last long.

An important corollary to Rowley-Conwy's main argument is his defense of “middle-range theory” (Binford 1977). It is indeed telling that, with the latest wave of nonscientific archeology, concern for the record and how it was formed has waned. It is as if, once they learned how hard it was to obtain information from the record, many archeologists simply gave up and began to *speculate* on prehistoric belief systems, worldviews, and societal relations, drawing more on empathy, subjective impressions, and preconceived notions than on analyses of facts (however skewed these may be by differential preservation/destruction or sampling bias). Rowley-Conwy's article is an indictment of an archeology in which seductive (but fatally flawed) ideas have come to take precedence over the meticulously developed empirical record.

Like the British Isles and Scandinavia, Vasco-Cantabrian Spain is an Atlantic region on the western fringe of Europe, far from and ecologically very unlike the Mediterranean source regions of domesticated wheats, barley, sheep, goats, cattle, and pigs, and has been the focus of recent discussions over the opposing theories of substantial migration versus substantial population continuity across the transition (see, e.g., Straus et al. 2001, 2002). The bulk of current evidence here too suggests the need to decouple the theory of “demic diffusion” from the undoubted westward spread of cultigens, domesticated animals, and (possibly) ceramic technology. Irrespective of how “the Neolithic” arrived on the Mediterranean shores of France and Spain, it was not long before its attributes were appearing in the Río Ebro drainage. It is apparent that *local* human groups with Mesolithic technologies and diversified, foraging-based subsistence bases adopted the new products and *modus vivendi* while—at least initially—continuing to live in many of the same places and to use many of the same kinds of stone tools as before (Alday 2002, Utrilla et al. 1998).

The situation here prior to the adoption of the Neolithic was reminiscent of that described by Rowley-

Conwy—relatively dense human settlement along the Atlantic shore but little evidence of occupation of the interior (but see Arias 1997; Arias et al. 1999:414–20). The first Neolithic evidences along the Atlantic facade date to about 5,800 uncal years BP (Arias et al. 1999). However, several sites at this time have few or no Neolithic economic products or ceramics but some double-bevel retouched geometric segments (another supposed Neolithic “marker”) and evidence of only hunting or shellfish collection, suggesting that at the “moment” of transition there was a mosaic of adaptations (or at least of functional site types) in this region (González Morales et al. n.d.). Wild animals continued to be hunted, but the change to animal husbandry appears to have been sudden and significant (Altuna et al. n.d.). Likewise, the pottery is very well made—not evidence of local people’s “starting from scratch” in this new technology. Indeed, the very intensive, trash-rich nature of settlements in the interior uplands during the earliest Neolithic is radically different from the ephemeral, finds-poor visits to the site of Mesolithic times. It is possible that forays into the mountains had brought these coastally based people into contact with the “Neolithized” inhabitants of the upper Ebro basin, and it was not only the novel pots that interested them but also the new foodstuffs and way of life. The question remains whether they were “pushed” or “pulled” into accepting the Neolithic lifeway. Further *scientific* research should help us to test at least the first proposition. The second should not be assumed to be correct and self-sufficient until the former has been dismissed on the basis of empirical evidence.

Clearly a rethinking and reorganization of human territories did take place in the early Neolithic of even this marginal region, but whatever changes arose were the consequence of a profound change in subsistence. Understanding prehistoric decision making and actions should be the central objective of regionally contextualized archeological research.

JULIAN THOMAS

School of Arts, Histories and Cultures, University of Manchester, Oxford Rd., Manchester M13 9PL, U.K.
(julian.thomas@man.ac.uk). 25 v 04

Rowley-Conwy’s revisionist account of the north-west European Neolithic is something of a “blast from the past,” his picture of a Neolithic juggernaut rolling across the continent leaving a landscape of scattered farmsteads in its wake evoking the textbooks of the seventies. The new evidence should indeed prompt a reconsideration of the period—but not a return to old models, for it speaks of complexity and variability. Rowley-Conwy wants to characterize *the* Neolithic, universally agricultural and sedentary and uniform throughout Europe. I doubt whether such a thing ever existed.

Rowley-Conwy justifies his argument in terms of a “new consensus” on Neolithic settlement and subsistence that he supports with parodic renderings of the arguments, neglecting to acknowledge that those argu-

ments have been revised and refined over the past 15 years. Most serious, he presents a polarized distinction between economy and ideology as prime movers in cultural change, omitting any discussion of social relationships. Hodder’s (1990) idea of a Neolithic “conceptual framework” is not a view that many would share. Instead, I would suggest that the Atlantic Neolithic involved a cultural repertoire which was drawn upon selectively by communities in pursuit of localized strategies and was not underlain by any uniform system of meaning (Thomas 1997, 2003). Economic change had no guaranteed causal status, and subsistence practice cannot be assumed to have formed an infrastructure on which all other aspects of society were built. With regard to monument building, the point is not that non-agricultural societies can produce “surplus” but that many economic systems have seasonally variable labour inputs, leaving time for other projects. Similarly, whereas Rowley-Conwy suggests that discussions of Mesolithic intensification assume a trajectory leading toward indigenous agriculture, these debates are often more concerned with the diversification of hunter-gatherer subsistence patterns and the introduction of domesticates into broad-spectrum economies.

Rowley-Conwy’s treatment of cereals, settlement, and domestic architecture demonstrates how far he squeezes the evidence to fit a universal model. Dental evidence suggesting that Neolithic Britons ate quantities of wild plants has been ignored entirely. He claims that a rejection of middle-range theory results in an approach which takes botanical evidence at face value, but he rejects attempts to evaluate the contexts from which these materials are recovered, arguing that timber buildings can be taken *at face value* as houses. Many of these buildings burned down, some more than once (Barclay, Brophy, and McGregor 2002). Given that European Bandkeramik longhouses scarcely ever burned, this is probably part of the broader practice of deliberately firing timber ceremonial structures. The contents of these buildings therefore cannot be taken as a “snapshot” of Neolithic domestic economy. Cereals and cattle meat were probably “special” foods for much of the British Neolithic. This does not mean that they had no calorific significance, but it does mean that we need to consider what people were eating the rest of the time. Furthermore, while there are now numerous timber buildings in Ireland and a number in Britain, almost all the dated examples fall into the first couple of centuries of the Neolithic (4000–3800 BC) (Cross 2003), and it seems possible that these buildings are a feature of the transition rather than the full-blown Neolithic itself.

Rowley-Conwy’s suggestion that “the observed pattern is . . . consistent with a cereal-based economy” is especially problematic when the Neolithic is compared with succeeding periods of prehistory. The numerous houses and field systems and abundant cereal remains of the Middle and Late Bronze Age in Britain contrast sharply with the Neolithic pattern, and it is hard to attribute this difference to any change in taphonomic conditions. In this context, the contrast between Britain and

Ireland is particularly interesting. One possibility is that the beginning of the Neolithic was quite different in these two islands as a consequence of the very different Mesolithics which preceded it. In Britain, the start of the Neolithic saw the substitution of domesticated ungulates for deer and aurochs, with the maintenance of aspects of settlement and mobility patterns. Postglacial Ireland lacked large wild ungulates, and it is possible that the start of the Neolithic saw a more sudden investment in domesticates, resulting in a more abrupt change in settlement and economy.

The contrast between Britain and Ireland demonstrates that there was not a single Neolithic in north-western Europe but many ways in which localized communities made use of new economic and symbolic resources. No doubt some people in Britain were working small plots of cereals with digging sticks and living nearby, but how many, and what were their relationships with mobile herders? Oxygen and lead isotope studies of human bone are now telling us that Neolithic people were travelling great distances and shifting from one community to another. We should be asking new questions about the Neolithic rather than retreating into outdated interpretations.

Reply

PETER ROWLEY-CONWY
Durham, U.K. 22 VI 04

This is as diverse and fascinating a set of comments as one could wish for, and I thank all the contributors. It is particularly intriguing that several commentators have sought both to take the arguments farther and to apply them more widely. In the Atlantic coastal regions Arias and Straus find common ground in their overlapping research areas in Iberia, despite much local variability. They accept that the Mesolithic of both Portugal and Vasco-Cantabria included quite dense coastal settlement and that this involved territoriality in, at any rate, Portugal, but neither argues for directional intensification and both favour a relatively rapid introduction of cereals and domesticates. Louwe Kooijmans makes a point that I absolutely accept—that I should not have considered the British Isles and southern Scandinavia in isolation but should have included the area north and west of the Belgian/German Bandkeramik. In an ideal world (in which I had much greater knowledge and more space at my disposal) I would have done so; I am happy that Louwe Kooijmans has to some extent “plugged the gap” with his comment. He too discerns a territorial but non-intensifying Late Mesolithic curiously slow to adopt “Neolithic” traits from the Bandkeramik. He makes explicit a point perhaps implicit in some of the other comments—that the Mesolithic of the Low Countries cannot be considered a “wild” opposite to the “domestic” Neolithic (using those terms *sensu* Hodder). I wish I could answer his question

about what was going on in the British Mesolithic at the same time. More unexpected is that Budja and Gronenborn have found some parallels with their *inland* research areas. Gronenborn too finds no data to support intensification in his Late Mesolithic and no signs of “complexity” except in the unique region of the Iron Gates. Budja considers the earlier agricultural “halt” in the Carpathian Basin, arguing likewise that there was little acculturation of hunter-gatherers but a rapid increase in the use of agricultural products from the start.

In their various ways these commentators thus all espouse models of rapid agricultural uptake. Budja and Gronenborn ask why agriculture appeared when it did, and both cite the important papers by Bonsall and colleagues (both 2002) as raising the possibility that environmental change may have played a part. Such theories have been very unfashionable for the past couple of decades, and it was not my purpose to raise this area of discussion. But since these two commentators have raised it, let me add my voice to theirs and suggest that, given the rapidity of the agricultural transition in various parts of Europe, it may indeed be time to revisit environmental explanations.

How should we conceive of “slow” or “rapid”? Arias makes the good point that many New Archaeologists have adopted parts of the post-processual view in that both perspectives envisage a slow change to agriculture despite their difference with regard to causal agents. Budja raises the issue of change in the Natufian in the Near East, where arrival from the outside plays no part in the origins of agriculture. In this context too, origins are most commonly perceived as slow. When archaeologists think “slow” we tend to assume millennia, because in our world that is long-term. But when we consider our own life spans, then a period of, say, eight human generations seems very long. Such a period would, however, vanish in the standard deviation of a typical Neolithic radiocarbon date—and consider the amount of change that has occurred since AD 1800. In our understanding of the Neolithic world a two-century change may seem extremely abrupt, but when we consider it in human generational terms much of its sting is drawn. Should we not rethink “slow” and “rapid”?

Jones and Nielsen approach the issues from inside the area considered, from Britain and Denmark, respectively. Nielsen’s interesting point that later agriculture may have destroyed much Early Neolithic evidence in the interior while leaving coastal fishing evidence intact to seem more important to us by default is one that I had not fully grasped but that is clearly well worth exploring in all the coastal regions of Europe. He highlights the rapidity of the spread of agriculture to the north beyond the latitude of Stockholm, suggesting parallels with the rapid Bandkeramik spread across the Central European loess belt. Our understanding of this spread in central Sweden has been hugely increased by the recent “coast-to-coast” project of the Universities of Gothenburg and Uppsala—the Skogsmossen settlement depicted in figure 6, *B*, was excavated under the auspices of this project. Nielsen’s rapid Swedish spread contrasts with the slow spread into France and the

static boundary north of the Bandkeramik mentioned by Louwe Kooijmans. All kinds of events were evidently taking place, and “stop,” “slow,” and “fast” were all clearly options. Despite announcing himself as a post-processualist, Jones agrees with the claim of house-based sedentary settlement, possibly because he works in the Orkney Islands. Any Neolithic inhabitant of these islands trying to live in an ephemeral structure would probably have found that the wind rendered it much more ephemeral than he desired! I agree with Jones that the “Wessex” model of transitory settlement does not apply here; I also doubt whether it applies to Wessex.

Where I disagree with Jones is when he asks, “How were the first domesticates understood?” I think this is a non-question because it is one that the archaeological record is fundamentally unable to answer. Furthermore, to expect a single answer to this question is an oversimplification: even had there been a single unitary “understanding” within one small community on the day the first cereals arrived (which I doubt), it would have changed almost immediately when the first bread or beer was consumed, again when the first plot was planted, again when it was harvested—and how different all of these would have been from an “understanding” in a local community in which cereals had been cultivated for three human generations. Yet our dating methods would not allow us to separate these local communities, even if we could ever discern the “understandings” in the first place.

Such problems emerge yet more starkly when one compares the comments of Straus and Thomas. Straus argues for middle-range theory and the use of archaeological data and against unfounded speculations about prehistoric belief systems, etc., expressing himself refreshingly succinctly. Thomas, in contrast, wants us to “evaluate the contexts” from which cereal remains come. I disagree with his suggestion that the fact that some timber buildings burnt down in some way invalidates their domestic nature. He cannot demonstrate whether the burning was a symbolic act deeply imbued with cultural meaning or merely a catastrophic accident. How, then, can we ever “evaluate the context”? He considers the paper a “blast from the past” and uses the indictment that is most damning in the relativist world of post-processualism: that it is “outdated.” But in a world where competing interpretations are evaluated against imperfect data this indictment has no force; the only criterion is how well an interpretation accords with and explains those data. In that spirit I hope that the paper will indeed be judged a “blast from the past”—the prehistoric past.

References Cited

- AARIS-SØRENSEN, K. 1988. *Danmarks forhistoriske dyreverden*. Copenhagen: Gyldendal.
- ALDAY, A. 2002. Las unidades industriales mesolíticas en la alta-media cuenca del Ebro. *Complutum* 13:19–50. [LGS]
- ALTUNA, J., G. CUENCA, M. ELORZA, J. C. GARCIA, K. MARIEZKURRENA, M. PEREZ, B. SANCHIZ, M. GONZALEZ MORALES, AND L. G. STRAUS. n.d. “Post-Pleistocene faunas from the archeological site of El Mirón Cave (Ramales de la Victoria, Cantabria, Spain): A preliminary summary,” in *Homenaje a Emiliano Aguirre*. Edited by E. Baquedano. Alcalá de Henares: Museo Arqueológico Regional. [LGS]
- AMMERMAN, ALBERT J. 2002. “Returning to the Neolithic transition in Europe,” in *El paisaje en el Neolítico mediterráneo/Neolithic landscapes of the Mediterranean*. Edited by E. Badal, J. Bernabeu, and B. Martí, pp. 13–21. Valencia: Universitat de València. [PA]
- AMMERMAN, A. J., AND L. L. CAVALLI-SFORZA. 1971. Measuring the rate of spread of early farming in Europe. *Man* 6:674–88.
- ANDERSEN, N. H. 1999. *Saruppladsen—Sarup*. Vol. 2. Jysk Arkæologisk Selskabs Skrifter 33(2).
- ANDERSEN, S. H. 2000. “Køkkenmøddinger” (shell middens) in Denmark: A survey. *Proceedings of the Prehistoric Society* 66:361–84. [PON]
- ANDERSEN, S. T. 1992. Early- and middle-neolithic agriculture in Denmark: Pollen spectra from soils in burial mounds of the Funnel Beaker culture. *Journal of European Archaeology* 1: 153–80.
- . 1993. “Jættestuernes landskab,” in *Jættestuer i Danmark*. Edited by S. T. Andersen and S. Hansen, pp. 67–88. Copenhagen: Miljøministeriet.
- ANDERSSON, M. 2003. *Skapa plats i landskapet*. Acta Archaeologica Lundensia series in 8°, 42.
- ANDERSSON, T. 1997. “Neolitiskt hus med vägränna från St. Herrestad,” in *Carpe Scania: Axplock ur Skånes förflutna*. Edited by P. Karsten, pp. 27–38. Stockholm: Riksantikvarieämbetet.
- ARAÚJO, ANA CRISTINA. 2003. “Long-term change in Portuguese early Holocene settlement and subsistence,” in *Mesolithic on the move: Papers presented at the Sixth International Conference on the Mesolithic in Europe, Stockholm 2000*. Edited by L. Larsson, H. Kindgren, K. Knutsson, D. Loeffler, and A. Akerlund, pp. 569–80. Oxford: Oxbow. [PA]
- ARIAS, PABLO. 1997. *Marisqueros y agricultores: Los orígenes del Neolítico en la fachada atlántica europea*. Santander: Universidad de Cantabria. [LGS]
- ARIAS, PABLO, AND ESTEBAN ÁLVAREZ-FERNÁNDEZ. n.d. “Iberian hunter-gatherers and death: A review of Upper Paleolithic and Mesolithic funerary evidence in the peninsula,” in *The Mesolithic of the Atlantic façade*. Edited by G. A. Clark and M. R. González Morales. Tempe: Arizona State University Press. In press. [PA]
- ARIAS, PABLO, J. ALTUNA, A. ARMENDARIZ, J. E. GONZÁLEZ URQUIJO, J. J. IBÁÑEZ, R. ONTAÑÓN, AND L. ZAPATA. 1999. Nuevas aportaciones al conocimiento de las primeras sociedades productoras en la región cantábrica. *Saguntum-PLAV Extra* 2:549–57. [LGS]
- ARTURSSON, M., T. LINDEROTH, M.-L. NILSSON, AND M. SVENSSON. 2003. “Byggnadskultur i södra & mellersta Skandinavien,” in *I det Neolitiska rummet: Skånska Spår—Arkeologi längs Västkystbanen*. Edited by M. Svensson, pp. 41–171. Lund: Riksantikvarieämbetet.
- ASHBEE, P., I. F. SMITH, AND J. G. EVANS. 1979. Excavation of three long barrows near Avebury, Wiltshire. *Proceedings of the Prehistoric Society* 45:207–300.
- BAILEY, G., AND N. MILNER. 2003. Coastal hunter-gatherers and social evolution: Marginal or central? *Before Farming* 4:1–22.
- BARCLAY, G. J. 1997. “The Neolithic,” in *Scotland: Environment and archaeology, 8000 BC–AD 1000*. Edited by K. J. Edwards and I. B. M. Ralston, pp. 127–49. Chichester: Wiley.
- BARCLAY, G. J., K. BROPHY, AND G. MCGREGOR. 2002. Claish, Stirling: An early Neolithic structure in its context. *Proceedings of the Society of Antiquaries of Scotland* 132: 65–137. [JT]
- BARRETT, J. C. 1994. *Fragments from antiquity: An archae-*

- ology of social life in Britain, 2900–1200 BC. Oxford: Blackwell.
- BENTLEY, R. ALEXANDER, T. DOUGLAS PRICE, JENS LÜNING, DETLEF GRONENBORN, JOACHIM WAHL, AND P. D. FULLAGAR. 2002. Prehistoric migration in Europe: Strontium isotope analysis of early Neolithic skeletons. *CURRENT ANTHROPOLOGY* 43:799–804. [DG, AJ]
- BERGLUND, B. E. Editor. 1991. *The cultural landscape during 6000 years in southern Sweden*. (Ecological Bulletins 41.) Copenhagen: Munksgaard. [PON]
- BINDER, D., AND R. MAGGI. 2001. Le Néolithique ancien de l'arc liguro-provençal. *Bulletin de la Société Préhistorique Française* 98:411–22.
- BINFORD, L. R. 1962. Archaeology as anthropology. *American Antiquity* 28:217–25. [LGS]
- . 1977. "General introduction," in *For theory building in archaeology*. Edited by L. R. Binford, pp. 1–10. New York: Academic Press. [LGS]
- BLANKHOLM, H. P. 1996. *On the track of a prehistoric economy: Maglemosian subsistence in early postglacial South Scandinavia*. Aarhus: University Press.
- BLUMLER, M. A. 1996. "Ecology, evolutionary theory, and agricultural origins," in *The origins and spread of agriculture and pastoralism in Eurasia*. Edited by D. R. Harris, pp. 25–50. London: UCL Press.
- BOGAARD, A. 2002a. The permanence, intensity, and seasonality of early crop cultivation in Western-Central Europe. Ph.D. diss., University of Sheffield, Sheffield, U.K.
- . 2002b. Questioning the relevance of shifting cultivation to Neolithic farming in the loess belt of western-central Europe: Evidence from the Hambach Forest experiment. *Vegetation History and Archaeobotany* 11:155–68. [MB]
- . 2004. The nature of early farming in central and south-east Europe. *Documenta Praehistorica* 31. In press. [MB]
- BOGUCKI, PETER. 2003. "Neolithic dispersals in riverine interior Central Europe," in *The widening harvest: The Neolithic transition in Europe—looking back, looking forward*. Edited by Albert J. Ammerman and Paolo Biagi, pp. 249–72. Archaeological Institute of America Colloquia and Conference Papers 6. Boston: Archaeological Institute of America. [DG]
- BONSALL, C., E. D. ANDERSON, AND M. MACKLIN. 2002. The Mesolithic–Neolithic transition in western Scotland and its European context. *Documenta Praehistorica* 29:1–19. [MB, DG]
- BONSALL, C., M. G. MACKLIN, D. E. ANDERSON, AND R. W. PAYTON. 2002. Climate change and the adoption of agriculture in north-west Europe. *European Journal of Archaeology* 5:7–21. [MB]
- BOONE, J. L. 2002. Subsistence strategies and early human population history: An evolutionary ecological perspective. *World Archaeology* 34:6–25.
- BOSERUP, E. 1965. *The conditions of agricultural growth*. Chicago: Aldine.
- BRADLEY, R. 1984. *The social foundations of prehistoric Britain*. Harlow: Longman.
- . 1993. *Altering the earth*. Edinburgh: Society of Antiquaries of Scotland.
- . 1998. *The significance of monuments*. London: Routledge.
- CASE, H. J. 1969. Neolithic explanations. *Antiquity* 43:176–86.
- CAULFIELD, S. 1978. "Neolithic fields: The Irish evidence," in *Early land allotment*. Edited by H. C. Bowen and P. J. Fowler, pp. 137–43. British Archaeological Reports British Series 48.
- . 1983. "The neolithic settlement of North Connaught," in *Landscape archaeology in Ireland*. Edited by T. Reeves-Smyth and F. Hamond, pp. 195–215. Oxford: British Archaeological Reports British Series 116.
- CAULFIELD, S., R. G. O'DONNELL, AND P. I. MITCHELL. 1998. ¹⁴C dating of a neolithic field system at Céide Fields, County Mayo, Ireland. *Radiocarbon* 40:629–40.
- CHILDE, V. G. 1957. 6th edition. *The dawn of European civilization*. St. Albans: Paladin.
- CHRISTENSEN, K. 1997. "Wood from fish weirs: Forestry in the stone age," in *The Danish Storebælt since the Ice Age*. Edited by L. Pedersen, A. Fischer, and B. Aaby, pp. 147–56. Copenhagen: A/S Storebælt Fixed Link.
- CLARK, J. G. D. 1966. The invasion hypothesis in British archaeology. *Antiquity* 40:172–89.
- CLARKE, D. I. 1976. "Mesolithic Europe: The economic basis," in *Problems in economic and social archaeology*. Edited by G. de G. Sieveking, I. H. Longworth, and K. E. Wilson, pp. 449–81. London: Duckworth.
- CLARKE, D. V. 1976. *The Neolithic village at Skara Brae, Orkney: 1972–73 excavations, an interim report*. Edinburgh: Her Majesty's Stationery Office.
- COLES, B. 1987. "Tracks across the wetlands: Multi-disciplinary studies in the Somerset Levels of England," in *European wetlands in prehistory*. Edited by J. M. Coles and A. J. Lawson, pp. 145–67. Oxford: Clarendon.
- COLES, J. M., AND B. J. ORME. 1984. Ten excavations along the Sweet Track (3200 bc). *Somerset Levels Papers* 10: 5–45.
- COONEY, G. 1997. "Images of settlement and the landscape in the Neolithic," in *Neolithic landscapes*. Edited by P. Topping, pp. 23–31. Oxford: Oxbow Books.
- . 2000. *Landscapes of Neolithic Ireland*. London: Routledge.
- . 2003. "Rooted or routed? Landscapes of Neolithic settlement in Ireland," in *Neolithic settlement in Ireland and Western Britain*, pp. 47–55. Edited by Ian Armit, Eileen Murphy, Eiméar Nelis, and Derek Simpson. Oxford: Oxbow. [DG]
- COPLEY, M. S., R. BERSTAN, S. N. DUDD, G. DOCHERTY, A. J. MUKHERJEE, V. STRAKER, S. PAYNE, AND R. P. EVERSHED. 2003. Direct chemical evidence for widespread dairying in prehistoric Britain. *Proceedings of the National Academy of Sciences, U.S.A.* 100:1524–29.
- CROSS, S. 2003. "Irish Neolithic settlement architecture: A reappraisal," in *Neolithic settlement in Ireland and Western Britain*. Edited by Ian Armit, Eileen Murphy, Eiméar Nelis, and Derek Simpson, pp. 195–202. Oxford: Oxbow. [JT]
- DARVILL, T. 1997. "Neolithic buildings in England, Wales, and the Isle of Man," in *Neolithic houses in Northwest Europe and beyond*. Edited by T. Darvill and J. Thomas, pp. 77–111. Oxford: Oxbow Books.
- DAVIS, S. J. M. 1984. "Khirkitia and its mammal remains: A neolithic Noah's Ark," in *Fouilles récentes à Khirkitia (Chypre) 1977–81*. Edited by A. L. Brun, pp. 147–79. Paris: ADPF.
- DÜRRWÄCHTER, C., O. E. CRAIG, G. TAYLOR, M. J. COLLINS, JOACHIM BURGER, AND KURT W. ALT. 2003. Rekonstruktion der Ernährungsweise in den mittel- und frühneolithischen Bevölkerungen von Trebur/Hessen und Herxheim/Pfalz anhand der Analyse stabiler Isotope. *Bulletin de la Société Suisse d'Anthropologie* 9:1–16. [DG]
- EDMONDS, M. 1997. Taskscape, technology, and tradition. *Analecta Praehistorica Leidensia* 29:99–110.
- . 1999. *Ancestral geographies of the Neolithic: Landscape, monuments, and memory*. London: Routledge.
- ENGHOFF, I. B. 1991. Fishing from the Stone Age settlement Norsminde. *Journal of Danish Archaeology* 8:41–50.
- ERIKSEN, P., AND T. MADSEN. 1984. Hanstedgård: A settlement site from the Funnel Beaker culture. *Journal of Danish Archaeology* 3:63–82.
- EVANS, C., AND M. KNIGHT. 2000. "A Fenland delta: Later prehistoric land-use in the lower Ouse reaches," in *Prehistoric, Roman, and post-Roman landscapes of the Great Ouse Valley*. Edited by M. Dawson, pp. 89–106. Council for British Archaeology Research Report 119.
- EVANS, C., J. POLLARD, AND M. KNIGHT. 1999. Life in woods: Tree-throws, "settlement," and forest cognition. *Oxford Journal of Archaeology* 18:241–54.
- EVANS, J. G., AND M. VAUGHAN. 1983. The molluscs from Knap of Howar, Orkney. *Proceedings of the Society of Antiquaries of Scotland* 113:106–14.
- FAIRBAIRN, A. 1999. "Charred plant remains," in *The harmony of symbols: The Windmill Hill causewayed enclosure*.

- Edited by A. Whittle, J. Pollard, and C. Grigson, pp. 139–57. Oxford: Oxbow.
- . 2000. "On the spread of crops across Neolithic Britain, with special reference to southern England," in *Plants in Neolithic Britain and beyond*. Edited by A. S. Fairbairn, pp. 107–21. Oxford: Oxbow.
- FAIRWEATHER, A. D., AND I. B. M. RALSTON. 1993. The Neolithic timber hall at Balbridie, Grampian Region, Scotland: The building, the date, the plant macrofossils. *Antiquity* 67:313–23.
- FISCHER, A., AND K. KRISTIANSEN. Editors. 2002. *The Neolithisation of Denmark: 150 years of debate*. Sheffield: J. R. Collis Publications. [PON]
- FLANNERY, T. F., AND J. P. WHITE. 1991. Animal translocation. *National Geographic Research and Exploration* 7: 96–113.
- FOWLER, P. 1981. "Wildscape to landscape: 'Enclosure' in prehistoric Britain," in *Farming practice in British prehistory*. Edited by R. Mercer, pp. 9–54. Edinburgh: University Press.
- FRITZ, G. J., AND B. D. SMITH. 1988. Old collections and new technology: Documenting the domestication of *Chenopodium* in eastern North America. *Midcontinental Journal of Archaeology* 13:3–27.
- GIBSON, J. L. 1998. Elements and organization of Poverty Point political economy: High-water fish, exotic rocks, and sacred earth. *Research in Economic Anthropology* 19:291–340.
- . 2000. *The ancient mounds of Poverty Point*. Gainesville: University Press of Florida.
- GLOB, P. V. 1949. Barkær: Danmarks ældste landsby. *Fra Nationalmuseets Arbejdsmark* 1949:5–16.
- GONZÁLEZ MORALES, M., L. G. STRAUS, A. DIEZ CASTILLO, AND J. RUIZ COBO. n.d. Postglacial coast and inland: The Mesolithic-Neolithic transition in Cantabrian Spain. *Munibe*. In press. [LGS]
- GÖRANSSON, H. 1995. *Alvastra pile dwelling: Palaeoethnobotanical studies*. Lund: University Press.
- GOSDEN, CHRIS, AND CHANTAL KNOWLES. 2001. *Collecting colonialism*. Oxford: Berg. [AJ]
- GOTFREDSSEN, A. B. 1998. En rekonstruktion af palæomiljøet omkring tre senmesolitiske bopladser i Store Åmose, Vestsjælland—baseret på pattedyr- og fugleknogler. *Geologisk Tidsskrift* 1998(2):92–103.
- GRAY, RUSSELL D., AND QUENTIN D. ATKINSON. 2003. Language tree divergence times support the Anatolian theory of Indo-European origin. *Nature* 426:435–39. [DG]
- GRIGSON, C. 1965. "Measurements of bones, horncores, antlers, and teeth," in *Windmill Hill and Avebury: Excavations by Alexander Keiller 1925–39*. Edited by I. F. Smith, pp. 145–67. Oxford: Clarendon.
- GROENMAN-VAN WAATERINGE, W. 1983. "The early agricultural utilization of the Irish landscape: The last word on the elm decline?" in *Landscape archaeology in Ireland*. Edited by T. Reeves-Smith and F. Hamond, pp. 217–32. British Archaeological Reports International Series 116.
- GROGAN, E. 2002. Neolithic houses in Ireland: A broader perspective. *Antiquity* 76:517–25.
- GRØN, O. 1997. "Social and ecological aspects of the mesolithic-neolithic transition in Denmark," in *The built environment of coast areas during the Stone Age*. Edited by D. Król, pp. 23–33. Gdansk: Regional Centre for Studies and Preservation of Built Environment in Gdansk.
- . 1998. "Neolithization in southern Scandinavia: A Mesolithic perspective," in *Harvesting the sea, farming the forest*. Edited by M. Zvelebil, R. Dennell, and L. Domanska, pp. 181–91. Sheffield: Academic Press.
- GRONENBORN, DETLEF. 1999. A variation on a basic theme: The transition to farming in southern Central Europe. *Journal of World Prehistory* 13:123–210. [DG]
- . 2003. "Migration, acculturation, and culture change in Western Temperate Eurasia, 6500–5000 cal BC," in *10th Neolithic studies*. Edited by Mihael Budja, pp. 79–91. Documenta Praehistorica 30. Ljubljana: Univerza v Ljubljani, Filozofska Fakulteta, Oddelek za Arheologijo. [DG]
- HALLGREN, F., U. DJERW, M. AF GEIERSTAM, AND M. STEINEKE. 1997a. Skogsmossen, an early neolithic settlement site and sacrificial fen in the northern borderland of the Funnel-beaker culture. *Tor* 29:49–111.
- HALLGREN, F., U. DJERW, Å. GAMRELL, M. AF GEIERSTAM, AND M. STEINEKE. 1997b. *Skogsmossen, en Tidig-neolitisk Bo- och Offerplats i norra Mellansverige*. Uppsala: Arkeologikonsult AB.
- HALLGREN, F., AND F. POSSNERT. 1997. Pottery design and time: The pottery from the TRB site Skogsmossen, in view of the AMS-datings of organic remains on pots/herds. *Tor* 29: 113–36.
- HARTZ, S., D. HEINRICH, AND H. LÜBKE. 2002. "Coastal farmers: The Neolithisation of northernmost Germany," in *The Neolithisation of Denmark: 150 years of debate*. Edited by A. Fischer and K. Kristiansen, pp. 321–40. Sheffield: J. R. Collis Publications. [LPL]
- HAYDEN, B. 1972. Population control among hunter-gatherers. *World Archaeology* 4:205–21.
- HIGGS, E. S., AND M. R. JARMAN. 1969. The origins of agriculture: A reconsideration. *Antiquity* 43:31–41.
- HIGHAM, C. F. W. 1967. Stock rearing as a cultural factor in prehistoric Europe. *Proceedings of the Prehistoric Society* 33: 84–106.
- HILLAM, J., C. M. GROVES, D. M. BROWN, M. G. L. BAILLIE, J. M. COLES, AND B. I. COLES. 1990. Dendrochronology of the English Neolithic. *Antiquity* 64:210–20.
- HILLMAN, G. 1981. "Reconstructing crop husbandry practices from charred remains of crops," in *Farming practice in British prehistory*. Edited by R. Mercer, pp. 123–62. Edinburgh: University Press.
- HODDER, I. 1986. *Reading the past*. Cambridge: Cambridge University Press.
- . 1990. *The domestication of Europe*. Oxford: Blackwell.
- HUNN, E. S., AND N. M. WILLIAMS. 1982. "Introduction," in *Resource managers: North American and Australian hunter-gatherers*. Edited by N. M. Williams and E. S. Hunn, pp. 1–16. Canberra: Australian Institute of Aboriginal Studies.
- HUNTLEY, J. P. 1997. *Carr House Sands, Hartlepool, the hurdle: Wood identifications*. Durham Environmental Archaeology Report 24/97.
- IBÁÑEZ ESTÉVEZ, JUAN JOSÉ, JESÚS EMILIO GONZÁLEZ URQUIJO, LEONOR PEÑA-CHOCARRO, LYDIA ZAPATA, AND VALÉRIE BEUGNIER. 2001. "Harvesting without sickles: Neolithic examples from humid mountain areas," in *Ethno-archaeology and its transfers: Papers from a session held at the European Association of Archaeologists Fifth Annual Meeting in Bournemouth 1999*. Edited by S. Beyries and P. Pétrequin, pp. 23–36. British Archaeological Reports International Series 983. [PA]
- INNES, J., J. BLACKFORD, AND P. ROWLEY-CONWY. 2003. The start of the Mesolithic-Neolithic transition in North-West Europe: The palynological contribution. *Antiquity* 77. <http://antiquity.ac.uk/projgall/blackford/blackford.html>.
- JARMAN, M. R. 1972. "European deer economies and the advent of the neolithic," in *Papers in economic prehistory*. Edited by E. S. Higgs, pp. 125–47. Cambridge: Cambridge University Press.
- JENNERT, K. 1984. *Den produktiva gåvan*. Acta Archaeologica Lundensia, series in 4°, 16.
- JENSEN, J. 2001. *Danmarks Oldtid: Stenalder 13,000–2,000 f. Kr.* Copenhagen: Gyldendal.
- JEUNESSE, CHRISTIAN. 2003. Néolithique "initial," néolithique ancien et néolithisation dans l'espace centre-europeen: Une vision rénovée. *Revue d'Alsace* 129:97–112. [DG]
- JEUNESSE, CHRISTIAN, AND ROSE-MARIE ARBOGAST. 1997. "A propos du statut de la chasse au Néolithique moyen: La faune sauvage dans les déchets domestiques et dans les mobiliers funéraires," in *Le Néolithique danubien et ses marges entre Rhin et Seine: XXIIe Colloque Interrégional sur le Néolithique, Strasbourg 27–29 octobre 1995*. Edited by Christian Jeunesse, pp. 81–102. Cahiers de l'Association pour la Pro-

- motion de la Recherche Archéologique en Alsace, suppl. 3. [DC]
- JONES, ANDREW. 1999. The world on a plate: Ceramics, food technology, and cosmology in Neolithic Orkney. *World Archaeology* 31 (1):55–78. [AJ]
- . 2002. *Archaeological theory and scientific practice*. Cambridge: Cambridge University Press. [AJ]
- JONES, G. 1984. "Interpretation of plant remains: Ethnographic models from Greece," in *Plants and ancient man*. Edited by W. v. Zeist and W. Casparie, pp. 43–61. Rotterdam: A. A. Balkema.
- . 2000. "Evaluating the importance of cultivation and collecting in neolithic Britain," in *Plants in Neolithic Britain and beyond*. Edited by A. S. Fairbairn, pp. 79–84. Oxford: Oxbow Books.
- . n.d. "Charred plant remains from the neolithic settlement at Lismore Fields, Buxton," in *Lismore Fields*. Edited by D. Garton. London: Prehistoric Society.
- KAELAS, L. 1991. "The society and economy of the megalith builders," in *Regions and reflections: In honour of Märta Strömberg*. Edited by K. Jennbert, L. Larsson, R. Petré, and B. Wyszomirska-Werbart, pp. 91–96. Acta Archaeologica Lundensia, series in 8°, 20.
- KEELEY, L. H. 1988. Hunter-gatherer economic complexity and "population pressure": A cross-cultural analysis. *Journal of Anthropological Archaeology* 7:373–411.
- KIND, CLAUS-JOACHIM. 1998. Komplexe Wildbeuter und frühe Ackerbauern: Bemerkungen zur Ausbreitung der Linearbandkeramik im südlichen Mitteleuropa. *Germania* 76 (1): 1–24. [DG]
- KING, M. P. 2001. Life and death in the 'neolithic': Dwelling-scapes in southern Britain. *European Journal of Archaeology* 4: 323–45.
- KLEJN, L. S. 1982. *Archaeological typology*. British Archaeological Reports International Series 153. [MB]
- KOCH, E. 1998. *Neolithic bog pots from Zealand, Møn, Lolland, and Falster*. Copenhagen: Det Kongelige Nordiske Oldskriftselskab.
- KRISTIANSEN, K. 1993. Neolithic farming practice: An archaeological response to the Göransson hypothesis. *Fornvännen* 88: 247–51.
- LARSSON, L. 1992. Neolithic settlement in the Skateholm area, southern Scania. *Meddelanden från Lunds Universitetets Historiska Museum* 1991–1992:5–44.
- LARSSON, M. 1984. *Tidigneolitikum i Sydvästskåne*. Acta Archaeologica Lundensia, series in 4°, 17.
- . 1986. Neolithization in Scania: A Funnel Beaker perspective. *Journal of Danish Archaeology* 5:244–47.
- LEGGE, A. J. 1981. "Aspects of cattle husbandry," in *Farming practice in British prehistory*. Edited by R. Mercer, pp. 169–81. Edinburgh: University Press.
- . 1989. "Milking the evidence: A reply to Entwistle and Grant," in *The beginnings of agriculture*. Edited by A. Milles, D. Williams, and N. Gardner, pp. 217–42. British Archaeological Reports International Series 496.
- LEGGE, A. J., AND P. A. ROWLEY-CONWY. 1988. *Star Carr revisited: A re-analysis of the large mammals*. London: University of London, Centre for Extra-Mural Studies.
- LIDÉN, K. 1995. *Prehistoric diet transitions*. Stockholm: Archaeological Research Laboratory.
- LIDÉN, KERSTIN, GUNILLA ERIKSSON, BENGT NORDQVIST, ANDERS GÖTHERSTRÖM, AND ERIK BENDIXEN. 2004. "The wet and the wild followed by the dry and the tame"—or did they occur at the same time? Diet in Mesolithic-Neolithic southern Sweden. *Antiquity* 78 (229): 23–31. [PA]
- LINDQVIST, C., AND G. POSSNERT. 1997. "The subsistence economy and diet at Jakobs/Ajvide, Eksta parish and other prehistoric dwelling and burial sites on Gotland in long-term perspective," in *Remote sensing*, vol. 1. Edited by G. Burenhuult, pp. 29–90. Stockholm: Institute of Archaeology, University of Stockholm.
- LIVERSAGE, D. 1992. *Barkær: Long barrows and settlements*. Copenhagen: Akademisk Forlag.
- LOPINOT, N. H. 1997. "Cahokian food production reconsidered," in *Cahokia: Domination and ideology in the Mississippian world*. Edited by T. R. Pauketat and T. E. Emerson, pp. 52–68. Lincoln: University of Nebraska Press.
- LOURANDOS, H. 1997. *Continent of hunter-gatherers*. Cambridge: Cambridge University Press.
- LOUWE KOOIJMANS, L. P. 2003. "The Hardinxveld sites in the Rhine/Meuse Delta: The Netherlands, 5500–4500 cal BC," in *Mesolithic on the move: Papers presented at the Sixth International Conference on the Mesolithic in Europe*. Edited by L. Larsson et al., pp. 608–24. Oxford: Oxbow. [LPL]
- LUBBOCK, J. 1865. *Pre-historic times*. London: Williams and Norgate.
- LÜNING, JENS. 1999. Review of: *Neolithic houses in North-west Europe and beyond*, edited by Timothy Darvill and Julian Thomas, pp. 346–50 (Oxbow Monograph 57, 1996). *Germania* 77 (1). [DC]
- MC CONNELL, P. 1897. 6th edition. *Note-book of agricultural facts and figures*. London: Crosby Lockwood.
- MACLEAN, A. C., AND P. ROWLEY-CONWY. 1984. The carbonized material from Boghead, Fochabers. *Proceedings of the Society of Antiquaries of Scotland* 114:69–71.
- MADSEN, T. 1979. Earthen long barrows and timber structures: Aspects of the early neolithic mortuary practice in Denmark. *Proceedings of the Prehistoric Society* 45:301–20.
- . 1986. Where did all the hunters go? An assessment of an epoch-making episode in Danish prehistory. *Journal of Danish Archaeology* 5:229–39.
- MALMER, M. 2002. *The Neolithic of South Sweden: TRB, GRK, and STR*. Stockholm: Kungl. Uitterhets Historik och Antikvitets Akademien.
- MALMROS, C. 1986. A neolithic road built of wood at Tibirke, Zealand, Denmark: Contribution to the history of coppice management in the Sub-boreal period. *Striae* 24:153–56.
- MALTBY, M. 1990. "Animal bones," in *The Stonehenge Environs Project*. Edited by J. Richards, pp. 57–61. London: Historic Buildings and Monuments Commission.
- MELLARS, P. 1998. "Postscript: Major issues in the interpretation of Star Carr," in *Star Carr in context*. Edited by P. Mellars and P. Dark, pp. 215–50. Cambridge: McDonald Institute for Archaeological Research.
- MILLES, A. 1986. "Charred remains of barley and other plants from Scord of Brouster," in *Scord of Brouster*. Edited by A. Whittle et al., pp. 119–22. Oxford: Oxford University Committee for Archaeology.
- MOFFETT, L., M. A. ROBINSON, AND V. STRAKER. 1989. "Cereals, fruits, and nuts: Charred plant remains from neolithic sites in England and Wales and the neolithic economy," in *The beginnings of agriculture*. Edited by A. Milles, D. Williams, and N. Gardner, pp. 243–61. British Archaeological Reports International Series 496.
- MOLONEY, A. 1996. "Wood analysis," in *Trackway excavations in the Mountdillon Bogs, Co. Longford, 1985–1991*. Edited by B. Raftery, pp. 343–57. Dublin: Department of Archaeology, University College Dublin.
- MONK, M. 1988. "Archaeobotanical study of samples from pipeline sites," in *Three Irish gas pipelines: New archaeological evidence in Munster*. Edited by M. Gowan, pp. 185–91. Dublin: Wordwell.
- . 2000. "Seeds and soils of discontent: An environmental archaeological contribution to the nature of the early neolithic," in *New agendas in Irish prehistory*. Edited by A. Desmond, G. Johnson, M. McCarthy, J. Sheehan, and E. S. Twohig, pp. 67–87. Bray: Wordwell.
- MORGAN, R. A. 1984. Tree-ring studies in the Somerset Levels: The Sweet Track 1979–1982. *Somerset Levels Papers* 10: 46–64.
- MULVANEY, D. J., AND J. KAMMINGA. 1999. *Prehistory of Australia*. St. Leonards, N.S.W.: Allen and Unwin.
- NASH, G. 1998. *Exchange, status, and mobility: Mesolithic*

- portable art of southern Scandinavia. British Archaeological Reports International Series 710.
- NIELSEN, F. O. 1997. "The Neolithic settlement on Bornholm," in *The built environment of coast areas during the Stone Age*. Edited by D. Król, pp. 119–27. Gdansk: Regional Centre for Studies and Preservation of Built Environment in Gdansk.
- NIELSEN, P. O. 1985. De første Bønder: Nye fund fra den tidligste Trægtbægerkultur ved Sigersted. *Aarbøger for Nordisk Oldkyndighed og Historie* 1984:96–126.
- . 1987. The beginning of the Neolithic: Assimilation or complex change? *Journal of Danish Archaeology* 5 (1986): 240–43. [PON]
- . 1997. De ældste langhuse: Fra toskibet til treskibet huse i Norden. *Bebyggelseshistorisk Tidsskrift* 33:9–30.
- NOE-NYGAARD, N. 1995. *Ecological, sedimentary, and geochemical evolution of the late-glacial to postglacial Åmose lacustrine basin, Denmark*. Oslo: Scandinavian University Press.
- ODGAARD, B. 1994. *The Holocene vegetation history of north-west Jutland, Denmark*. Opera Botanica 123. [PON]
- ÖSTERHOLM, I. 1989. *Bosättningsmönstret på Gotland under Stenåldern*. Stockholm: University of Stockholm Institute of Archaeology.
- ÖSTERHOLM, I., AND S. ÖSTERHOLM. 1984. "The kitchen middens along the coast of Ballysadare Bay," in *The archaeology of Carrowmore*. Edited by G. Burenhult, pp. 326–45. Stockholm: University of Stockholm Institute of Archaeology.
- OTTE, MARCEL, AND PHILLIP NOIRET. 2001. Le Mésolithique du Bassin Pannonien et la formation du Rubane. *L'Anthropologie* 105:409–19. [DG]
- OXFORD ARCHAEOLOGICAL UNIT. 2000. White Horse Stone: A neolithic longhouse. *Current Archaeology* 168: 450–53.
- PEDERSEN, L. 1997. "They put fences in the sea," in *The Danish Storebælt since the Ice Age*. Edited by L. Pedersen, A. Fischer, and B. Aaby, pp. 124–43. Copenhagen: A/S Storebælt Fixed Link.
- PERSSON, P. 1999. *Neolitikums Början: Undersökningar kring jordbrukets introduction i Nordeuropa*. Uppsala and Gothenburg: Departments of Archaeology.
- PETERSEN, K. STRAND. 1993. Environmental changes recorded in the Holocene molluscan faunas from Djursland, Denmark. *Scripta Geologica* 2:359–69. [PON]
- PETERSSON, H. 1997. Where did all the farmers come from? *Journal of Danish Archaeology* 13:179–90.
- POLLARD, J. 1999. "These places have their moments": Thoughts on settlement practices in the British Neolithic," in *Making places in the prehistoric world*. Edited by J. Brück and M. Goodman, pp. 76–93. London: UCL Press.
- POLLARD, J., AND A. REYNOLDS. 2002. *Avebury: The biography of a landscape*. Stroud: Tempus.
- PRENTISS, C. W., AND C. J. CHATTERS. 2003. Cultural diversification and decimation in the prehistoric record. *CURRENT ANTHROPOLOGY* 44:33–58.
- PRICE, T. D. 1996. "The first farmers of southern Scandinavia," in *The origins and spread of agriculture and pastoralism in Eurasia*. Edited by D. R. Harris, pp. 346–62. London: UCL Press.
- . 2000. "The introduction of farming in northern Europe," in *Europe's first farmers*. Edited by T. D. Price, pp. 260–300. Cambridge: Cambridge University Press.
- PRICE, T. D., R. A. BENTLEY, J. LÜNING, D. GRONENBORN, AND J. WAHL. 2001. Prehistoric human migration in the Linearbandkeramik of central Europe. *Antiquity* 75: 593–603. [AJ]
- RENFREW, COLIN. 1996. "Language families and the spread of farming," in *The origins and spread of agriculture and pastoralism in Eurasia*. Edited by D. H. Harris, pp. 70–92. London: University College of London Press. [DG]
- . 2002. "The emerging synthesis": The archaeogenetics of farming/language dispersals and other spread zones," in *Examining the farming/language dispersal hypothesis*. Edited by P. Bellwood and Colin Renfrew, pp. 3–16. Cambridge: McDonald Institute for Archaeological Research. [DG]
- RICHARDS, COLIN. 1990. "The Late Neolithic house in Orkney," in *The social archaeology of houses*. Edited by R. Samson, pp. 88–101. Edinburgh: Edinburgh University Press.
- RICHARDS, MICHAEL P. 2003. The Neolithic transition in Europe: Archaeological models and genetic evidence. *Documenta Praehistorica* 30:159–68.
- RICHARDS, M. P., AND E. KOCH. 2001. Neolitisk kost: Analyser a kvælstof-isotopen ¹⁵N i menneskeskeletter fra yngre stenalder. *Aarbøger for Nordisk Oldkyndighed og Historie* 1999:7–17.
- RICHARDS, MICHAEL P., AND V. MACAULAY. 2000. "Genetic data and the colonization of Europe: Genealogies and founders," in *Archaeogenetics: DNA and the population prehistory of Europe*. Edited by C. Renfrew and K. Boyle, pp. 139–51. Cambridge: McDonald Institute Monographs.
- RICHARDS, MICHAEL P., T. DOUGLAS PRICE, AND EVA KOCH. 2003. Mesolithic and Neolithic subsistence in Denmark: New stable isotope data. *CURRENT ANTHROPOLOGY* 44 (2): 288–95. [PA]
- RICHARDS, MICHAEL P., RICK J. SCHULTING, AND ROBERT E. M. HEDGES. 2003. Sharp shift in diet at onset of Neolithic. *Nature* 425:366. [PA]
- RICHMOND, A. 1999. *Preferred economies: The nature of the subsistence base throughout mainland Britain during prehistory*. British Archaeological Reports British Series 290.
- ROBINSON, M. 2000. "Further considerations of Neolithic charred cereals, fruit, and nuts," in *Plants in Neolithic Britain and beyond*. Edited by A. S. Fairbairn, pp. 85–90. Oxbow: Oxbow Books.
- ROWLEY-CONWY, PETER. 1984. The laziness of the short-distance hunter: The origins of agriculture in western Denmark. *Journal of Anthropological Archaeology* 3:300–324. [DG]
- . 1985. The origin of agriculture in Denmark: A review of some theories. *Journal of Danish Archaeology* 4:188–95. [PON]
- . 1986. "Between cave painters and crop planters: Aspects of the temperate European mesolithic," in *Hunters in transition*. Edited by M. Zvelebil, pp. 17–32. Cambridge: Cambridge University Press.
- . 1987. The interpretation of ard marks. *Antiquity* 61: 263–66.
- . 1993. "Season and reason: The case for a regional interpretation of mesolithic settlement patterns," in *Hunting and animal exploitation in the Later Palaeolithic and Mesolithic of Eurasia*. Edited by G. L. Peterkin, H. Bricker, and P. Mellars, pp. 179–88. Archaeological Papers of the American Anthropological Association 4.
- . 1995. Wild or domestic? On the evidence for the earliest domestic cattle and pigs in South Scandinavia and Iberia. *International Journal of Osteoarchaeology* 5:115–26.
- . 1998a. Meat, furs, and skins: Mesolithic animal bones from Ringkloster, a seasonal hunting camp in Jutland. *Journal of Danish Archaeology* 12 (for 1994–95):87–98.
- . 1998b. "Cemeteries, seasonality, and complexity in the Ertebølle of southern Scandinavia," in *Harvesting the sea, farming the forest: The emergence of Neolithic societies in the Baltic region*. Edited by M. Zvelebil, L. Domanska, and R. Dennell, pp. 193–202. Sheffield: Sheffield Academic Press.
- . 1999. "Economic prehistory in southern Scandinavia," in *World prehistory: Studies in memory of Grahame Clark*. Edited by J. Coles, R. M. Bewley, and P. Mellars, pp. 125–59. Proceedings of the British Academy 99.
- . 2000. "Through a taphonomic glass, darkly: The importance of cereal cultivation in prehistoric Britain," in *Taphonomy and interpretation*. Edited by S. Stallibrass and J. Huntley, pp. 43–53. Oxford: Oxbow Books.
- . 2001. "Time, change, and the archaeology of hunter-gatherers: How original is the 'Original Affluent Society'?" in *Hunter-gatherers: An interdisciplinary perspective*. Edited by C. Panter-Brick, R. H. Layton, and P. Rowley-Conwy, pp. 39–72. Cambridge: Cambridge University Press.
- . 2003a. "Early domestic animals in Europe: Imported or

- locally domesticated?," in *The widening harvest: The Neolithic transition in Europe, looking forward, looking back*. Edited by A. Ammerman and P. Biagi, pp. 99–117. Archaeological Institute of America Colloquia and Conference Papers 6.
- . 2003b. "No fixed abode? Nomadism in the Northwest European neolithic," in *Formal disposal of the dead in Atlantic Europe during the Mesolithic-Neolithic interface 6000–3000 BC*. Edited by G. Burenhult and S. Westergaard, pp. 115–44. British Archaeological Reports International Series 1201.
- . 2004. "Hunter-gatherer intensification and the straight arrow of progress: Australia and Northwest Europe compared," in *Prehistory in a global perspective: Essays in honour of Professor Randi Haaland*. Edited by T. Oestigaard, N. Anfinsen, and T. Saetersdal. British Archaeological Reports International Series 1210.
- ROWLEY-CONWY, P., P. HALSTEAD, AND P. COLLINS. 2002. Derivation and application of a food utility index (FUI) for European wild boar (*Sus scrofa* L.). *Environmental Archaeology* 7:77–87.
- SCHIBLER, JÖRG, STEFANIE JACOMET, HEIDEMARIE HÜSTER-PLOGMANN, AND CHRISTOPH BROMBACHER. 1997. "Synthese-Synthesis: Mit einem Beitrag von Christian Maise," in *Ökonomie und Ökologie neolithischer und bronzezeitlicher Ufersiedlungen am Zürichsee*. Edited by Jörg Schibler, Heidemarie Hüster-Plogmann, Stefanie Jacomet, Christoph Brombacher, Eduard Gross-Klee, and Antoinette Rast-Eicher, pp. 329–61. Monographien der Kantonsarchäologie Zürich 20. Zürich and Egg: Direktion der öffentlichen Bauten des Kantons Zürich. [DG]
- SCHULTING, RICK J., AND MICHAEL P. RICHARDS. 2001. Dating women and becoming farmers: New palaeodietary and AMS dating evidence from the Breton Mesolithic cemeteries of Téviec and Hoëdic. *Journal of Anthropological Archaeology* 20:314–44. [PA]
- . 2002a. Finding the coastal mesolithic in southwest Britain: AMS dates and stable isotope results on human remains from Caldey Island, South Wales. *Antiquity* 76:1011–25.
- . 2002b. The wet, the wild, and the domesticated: The Mesolithic-Neolithic transition on the west coast of Scotland. *European Journal of Archaeology* 5:147–89.
- SHERIDAN, A. 2003. "Ireland's earliest passage tombs: A French connection?" in *Formal disposal of the dead in Atlantic Europe during the Mesolithic-Neolithic interface 6000–3000 BC*. Edited by G. Burenhult and S. Westergaard, pp. 9–26. British Archaeological Reports International Series 1201.
- SIMON, M. L. 2000. "Regional variations in plant use strategies in the Midwest during the Late Woodland," in *Late Woodland societies*. Edited by T. E. Emerson, D. L. McElrath, and A. C. Fortier, pp. 37–75. Lincoln: University of Nebraska Press.
- STÖGREN, K.-G. 2003. "Megaliths, settlement, and subsistence in Bohuslän, Sweden," in *Formal disposal of the dead in Atlantic Europe during the Mesolithic-Neolithic interface 6000–3000 BC*. Edited by G. Burenhult and S. Westergaard, pp. 167–76. British Archaeological Reports International Series 1201.
- SKAK-NIELSEN, N. V. 2003. Hvordan kom bondebruget til Sydiskandinavian? *Fornvännen* 98:1–12.
- SLOANE, D. 1986. Shell middens of Scotland. *Popular Archaeology*, February, pp. 10–15.
- SØRENSEN, H. H., AND J. BECH. 1998. "Udgravningerne og anlæggene på Spodsbjergbopladsen," in *Spodsbjerg—en yngre stenalders boplads på Langeland*. Edited by H. H. Sørensen, pp. 29–85. Rudkøbing: Langelands Museum.
- STEPPAN, KARLHEINZ. 1993. Osteologische und taphonomische Untersuchungen an Tierknochenfunden aus der mesolithischen Freilandfundstelle Rottenburg-Siebenlinden I. Lkr. Tübingen. *Zeitschrift für Archäologie* 27:9–16. [DG]
- STEENBERG, A. 1980. *New Guinea gardens: A study of husbandry with parallels in prehistoric Europe*. London: Academic Press.
- STRAUS, L. G., M. GONZÁLEZ MORALES, W. FARRAND, AND W. HUBBARD. 2001. Sedimentological and stratigraphic observations in El Mirón, a late Quaternary cave site in the Cantabrian Cordillera, northern Spain. *Geoarchaeology* 16:603–30. [LGS]
- STRAUS, L. G., M. GONZÁLEZ MORALES, M. P. GARCÍA-GELABERT, AND MIGUEL A. FANO. 2002. The Late Quaternary human uses of a natural territory: The case of the Río Asón drainage. *Journal of Iberian Archaeology* 4:21–61. [LGS]
- SYKES, B. 2001. *The seven daughters of Eve*. London: Bantam.
- TAUBER, H. 1981. ¹³C evidence for dietary habits of prehistoric man in Denmark. *Nature* 292:332–33.
- . 1982. Carbon-13 evidence for the diet of prehistoric humans in Denmark. *PACT* 7:235–37.
- . 1983. ¹⁴C dating of human beings in relation to dietary habits. *PACT* 8, IV (10):365–75. [PON]
- TAYLOR, M. 1988. "Some preliminary thoughts on coppicing and pollarding at Etton," in *The exploitation of wetlands*. Edited by P. Murphy and C. French, pp. 93–99. British Archaeological Reports British Series 186.
- TESCH, S. 1992. "The long-term development of a settlement region on the coastal plain: The Köpinge area," in *The archaeology of the cultural landscape*. Edited by L. Larsson, J. Callmer, and B. Stjernquist, pp. 161–249. Acta Archaeologica Lundensia, series in 4°, 19.
- THOMAS, J. 1988. Neolithic explanations revisited: The mesolithic-neolithic transition in Britain and South Scandinavia. *Proceedings of the Prehistoric Society* 54:59–66.
- . 1991. *Rethinking the Neolithic*. Cambridge: Cambridge University Press.
- . 1993. "Discourse, totalization, and 'The Neolithic'," in *Interpretative archaeology*. Edited by C. Tilley, pp. 357–94. Oxford: Berg.
- . 1996a. "Neolithic houses in mainland Britain and Ireland: A sceptical view," in *Neolithic houses in Northwest Europe and beyond*. Edited by T. Darvill and J. Thomas, pp. 1–12. Oxbow Monograph 57.
- . 1996b. "The cultural context of the first use of domesticates in continental Central and Northwest Europe," in *The origins and spread of agriculture and pastoralism in Eurasia*. Edited by D. R. Harris, pp. 310–22. London: UCL Press.
- . 1997. The materiality of the mesolithic-neolithic transition in Britain. *Analecta Praehistorica Leidensia* 29:57–64.
- . 1998. "Towards a regional geography of the Neolithic," in *Understanding the Neolithic of North-Western Europe*. Edited by M. Edmonds and C. Richards, pp. 37–60. Glasgow: Cruithne Press.
- . 1999. *Understanding the Neolithic*. London: Routledge.
- . 2003. Thoughts on the "repacked" Neolithic Revolution. *Antiquity* 77:67–74.
- THOMAS, NICHOLAS. 1991. *Entangled objects: Exchange, material culture, and colonialism in the Pacific*. London: Harvard University Press. [AJ]
- THORPE, I. J. 1996. *The origins of agriculture in Europe*. London: Routledge.
- THRANE, H. 1985. "Bronze Age settlements," in *Archaeological formation processes*. Edited by K. Kristiansen, pp. 142–51. Copenhagen: Nationalmuseet.
- . 1989. Danish plough-marks from the Neolithic and Bronze Age. *Journal of Danish Archaeology* 8:111–25.
- TILLEY, C. 1996. *An ethnography of the Neolithic*. Cambridge: University Press.
- TILLMANN, ANDREAS. 1993. Kontinuität oder Diskontinuität? Zur Frage einer bandkeramischen Landnahme im südlichen Mitteleuropa. *Archäologische Informationen* 16:157–87. [DG]
- TOMII, M. 1996. Neolithic sedentism of small-scale communities in the British Isles: Inference from housing and woodland exploitation. M.A. thesis, Department of Archaeology, University of Durham, Durham, U.K.
- TROY, C. S., D. E. MAC HUGH, J. F. BAILEY, D. A. MAGEE, R. T. LOFTUS, P. CUNNINGHAM, A. T. CHAMBERLAIN, B. C. SYKES, AND D. G. BRADLEY. 2001. Genetic evidence for Near-Eastern origins of European cattle. *Nature* 410:1088–91.

- UTRILLA, P., A. CAVA, A. ALDAY, V. BALDELLOU, I. BARANDIARÁN, C. MAZO, AND L. MONTES. 1998. Le passage du Mésolithique au Néolithique ancien dans le bassin de l'Ebre (Espagne) d'après les datations C¹⁴. *Préhistoire Européenne* 12:171-94. [LGS]
- VIGNE, J.-D. 1988. *Les mammifères post-glaciaires de Corse: Etude archéozoologique*. Gallia Préhistoire, suppl. 26.
- . 2003. "L'exploitation des animaux à Torre Sabea: Nouvelles analyses sur les débuts de l'élevage en Méditerranée centrale et occidentale," in *Torre Sabea: Un établissement du néolithique ancien en Salento*. Edited by J. Guilaine and G. Cremonesi, pp. 325-59. Rome: Ecole Française de Rome. [PA]
- WADDINGTON, C. 2000. "The Neolithic that never happened?" in *Northern pasts: Interpretations of the later prehistory of northern England and southern Scotland*. Edited by J. Harding and R. Johnston, pp. 33-44. British Archaeological Reports British Series 302.
- WARD, H. D. 1998. The paleoethnobotanical record of the Poverty Point culture: Implications of past and current research. *Southeastern Archaeology* 17:166-74.
- WHEELER, A. 1983. Fish remains from Knap of Howar, Orkney. *Proceedings of the Society of Antiquaries of Scotland* 113: 103-5.
- WHITLEY, JAMES. 2002. Too many ancestors. *Antiquity* 76: 119-26. [DG]
- WHITTLE, A. 1996. 2d edition. *Neolithic Europe: A survey*. Cambridge: Cambridge University Press.
- . 1997. "Moving on and moving around: Neolithic settlement mobility," in *Neolithic landscapes*. Edited by P. Topping, pp. 15-22. Oxford: Oxbow Books.
- . 1999. "The Neolithic period, c. 4000-2500/2200 BC," in *The archaeology of Britain*. Edited by J. Hunter and I. Ralston, pp. 58-76. London: Routledge.
- . 2003. *The archaeology of people: Dimensions of Neolithic life*. London: Routledge.
- WHITTLE, A., M. KEITH-LUCAS, A. MILLES, B. NODDLE, S. REES, AND J. C. C. ROMANS. 1986. *Scord of Brouster: An early agricultural settlement on Shetland*. Oxford: Oxford University Committee for Archaeology.
- WHITTLE, A., J. POLLARD, AND C. GRIGSON. 1999. *The harmony of symbols: The Windmill Hill causewayed enclosure*. Oxford: Oxbow Books.
- WOODBURN, J. 1982. Egalitarian societies. *Man* 17:431-51.
- WOODMAN, P. C. 1985. *Excavations at Mount Sandel 1973-77*. Belfast: Her Majesty's Stationery Office.
- . n.d. "The exploitation of Ireland's coastal resources: A marginal resource through time?" in *The Mesolithic of the Atlantic façade*. Edited by M. Gonzales Morales and G. Clark. Arizona State University Anthropological Research Papers.
- WOODMAN, P. C., E. ANDERSON, AND N. FINLAY. 1999. *Excavations at Ferriter's Cove, 1983-85: Last foragers, first farmers in the Dingle Peninsula*. Bray: Wordwell.
- ZILHÃO, J. 2001. Radiocarbon evidence for maritime pioneer colonization at the origins of farming in West Mediterranean Europe. *Proceedings of the National Academy of Sciences, U.S.A.* 98:14180-85.
- ZVELEBIL, M. 1994. Plant use in the mesolithic and its role in the transition to farming. *Proceedings of the Prehistoric Society* 60:35-74.
- . 1995. Hunting, gathering, or husbandry? Management of food resources by the late Mesolithic communities of temperate Europe. *MASCA Research Papers in Science and Archaeology* 12 (suppl.):79-104.
- . 1996. "The agricultural frontier and the transition to farming in the circum-Baltic region," in *The origins and spread of agriculture and pastoralism in Eurasia*. Edited by D. R. Harris, pp. 323-45. London: UCL Press.
- ZVELEBIL, M., AND P. ROWLEY-CONWY. 1984. Transition to farming in northern Europe: A hunter-gatherer perspective. *Norwegian Archaeological Review* 17:104-28.
- . 1986. "Foragers and farmers in Atlantic Europe," in *Hunters in transition*. Edited by M. Zvelebil, pp. 67-93. Cambridge: Cambridge University Press.